

MAY 1, 1961

AUTOMOTIVE INDUSTRIES

ENGINEERING • MANAGEMENT • PRODUCTION • DESIGN

A CHILTON PUBLICATION

INDIANAPOLIS "500" PREVIEW... .. See Page 35



Above:—Lou Meyer, Sr., with the new model counterclockwise-rotating Meyer & Drake Offenhauser engine. Lou Meyer is a three-time winner at Indianapolis and now head of the engine-making firm of Meyer & Drake.

ALSO IN THIS ISSUE . . .

NEW AUTOMOBILES AT GENEVA SALON
EVOLUTION OF TRANSFER MACHINES
COMMUNIST CARS AT LEIPZIG FAIR

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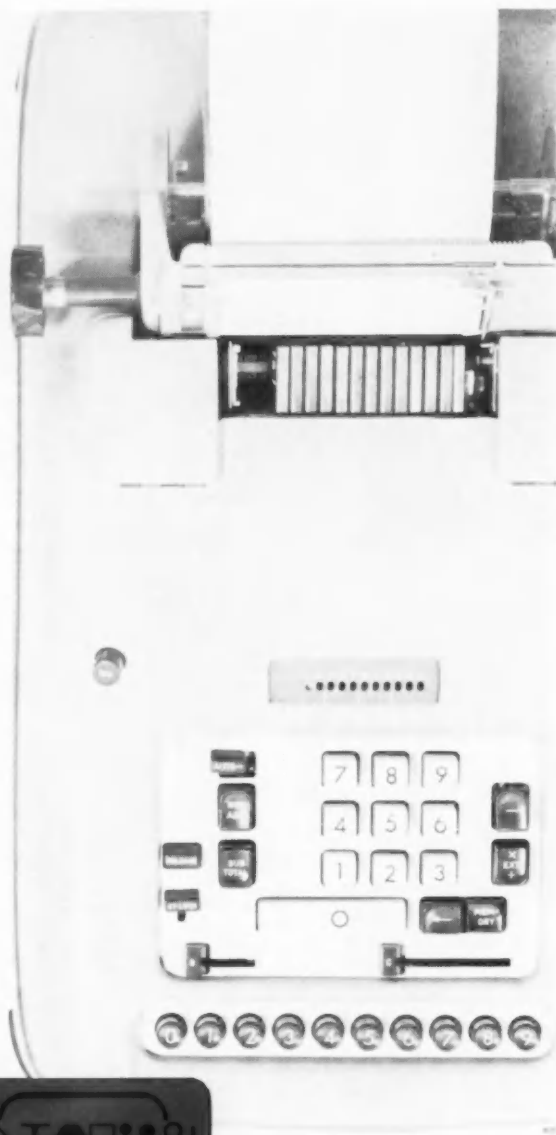
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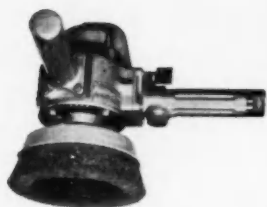


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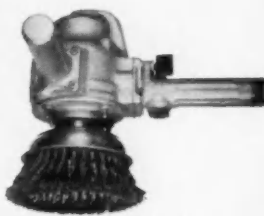
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differential pinions and side gears, transmission shafts, and integral axle and sun gear.

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

MAY 1, 1961

Passenger Cars • Trucks • Buses • Aircraft • Tractors
• Engines • Bodies • Trailers • Road Machinery •
Farm Machinery • Parts and Components • Accessories
• Production and Processing Equipment •
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VOL. 124 No. 9

Features • • •

▼ More Power, More Speed Foreseen at Indianapolis 500

Most of the cars that will try for the 33 starting positions at Indianapolis are built by Frank Kurtis or A. J. Watson, and powered by Meyer & Drake engines. New-est improvements in these and in other cars and engines are described and illustrated. Page 35

▼ The Transfer Machine

The modern transfer machine can be designed in any reasonable size and with sufficient heads to finish such complicated parts as cylinder blocks or heads, transmission cases, etc. Its evolution and applications are described in an article by Joseph Geschelin, Detroit editor. Page 39

▼ The Geneva 1961 Salon

Many European automobile builders displayed their newest models at the Geneva Show instead of waiting for later exhibitions; German makers in Frankfurt, the French in Paris, etc. Page 42

▼ Leipzig Fair Reveals Latest Communist Models

East Germany, Russia, Hungary, and Poland were among the exhibitors at the Leipzig Fair. On the western side, vehicle exhibitors included Rootes, Renault, Simca, Fiat, Daimler-Benz, M.A.N., Deutz and Büssing. Page 44

▼ Machine Tool Builders Report Slight Upward Trend

AI's latest quarterly survey of the machine tool industry shows small rises in order backlogs and inquiry activity at the close of the 1st quarter. Labor and material costs continue to creep up, and machine prices will bear watching. Page 46

▼ Design Features of the Buick Special and Olds F-85 Engines

Part II of this two-part article describes additional design details of these two new aluminum engines. Cylinder blocks, pistons, connecting rods, exhaust manifolds, and crankshafts are discussed. Engine weight comparisons also are given. Page 49

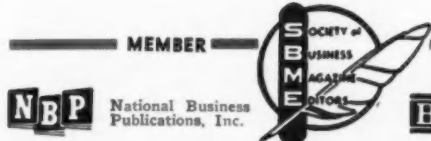
▼ New Connecting Rod Line at Deere's Waterloo Works

High speed, precision machine tools are used to produce connecting rods for the new John Deere engines. Page 52

▼ 13 New Product Items and Other Features Such as:

News of the Machinery Industry; Industry Statistics; and News of the Automotive and Aviation Industry.

... continued on next page



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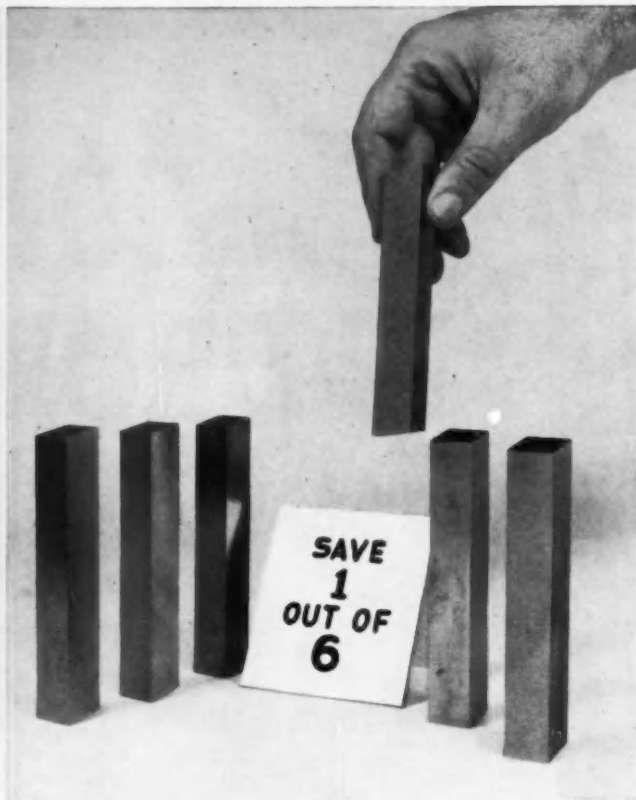
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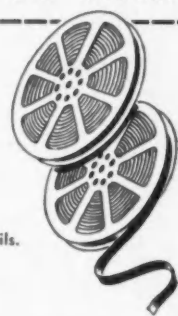
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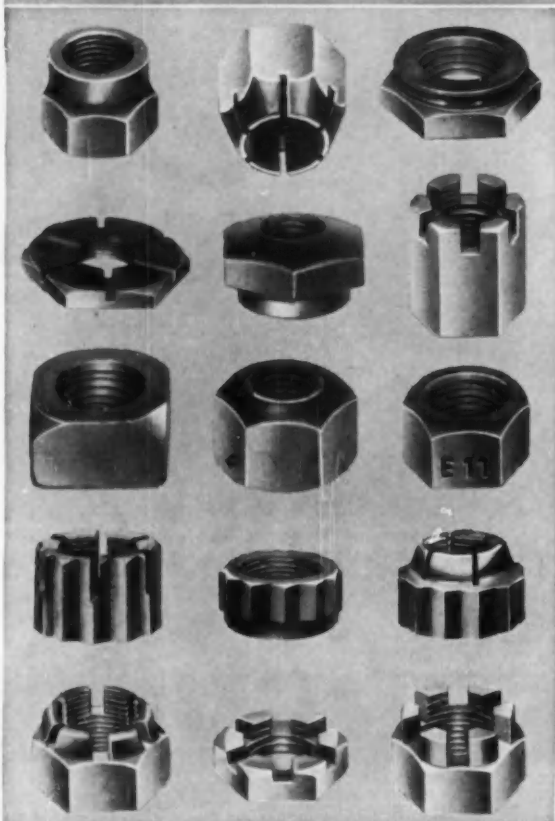
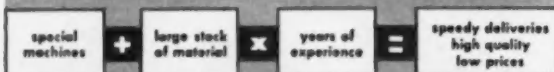
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| American Foundrymen's Society, 65th Annual Castings Congress, San Francisco | May 7-11 |
| American Society of Mechanical Engineers, Lubrication Symposium, Miami Beach | May 8-9 |
| The Society of Plastics Engineers, Plastics in the Automotive Industry, Detroit | May 9 |
| Material Handling Institute, Eastern States Show, Philadelphia | May 9-11 |
| American Institute of Industrial Engineers, National Conference and Convention, Detroit | May 11-13 |
| Association of American Battery Manufacturers, Spring Convention, New Orleans | May 15-17 |
| Society for Non-Destructive Testing, North East Regional Convention, Montreal, Que. | May 17-19 |
| Industrial Heating Equipment Association, Annual Spring Meeting, Hot Springs, Va. | May 21-24 |
| Design Engineering Show and Conference, Detroit | May 22-25 |
| American Society of Tool & Manufacturing Engineers, 1961 Engineering Conference & Exhibit, New York | May 22-26 |
| American Iron and Steel Institute, Annual Meeting, New York City | May 24-25 |
| National Machine Tool Builders' Association, 59th Spring Meeting, Washington | June 1 |
| American Gear Manufacturers Association, Annual Meeting, Hot Springs, Va. | June 4-7 |
| Instrument Society of America, Instrument-Automation Conference & Exhibit, Pittsburgh | June 5-8 |
| Society of Automotive Engineers, Summer Meeting, St. Louis | June 5-9 |
| The Society of the Plastics Industries, Inc., 9th Annual Plastics Exposition, New York City | June 5-9 |
| Malleable Founders Society, Annual Meeting, Colorado Springs, Colorado | June 8-9 |

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A typical example of how transfer type machine tools can be designed to guard against obsolescence is illustrated by this new Cross Transfer-matic. It completely machines and assembles power steering gear housings except for the mounting feet.

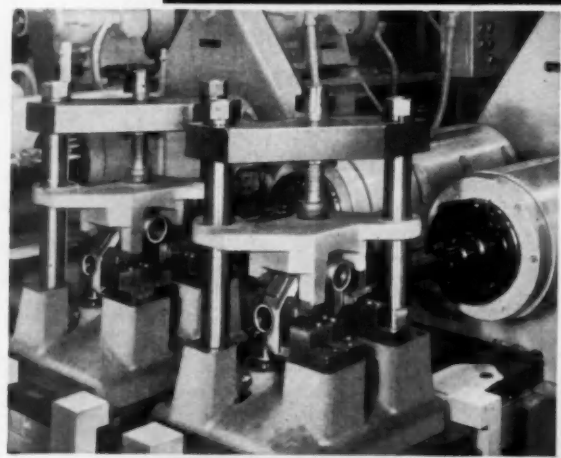
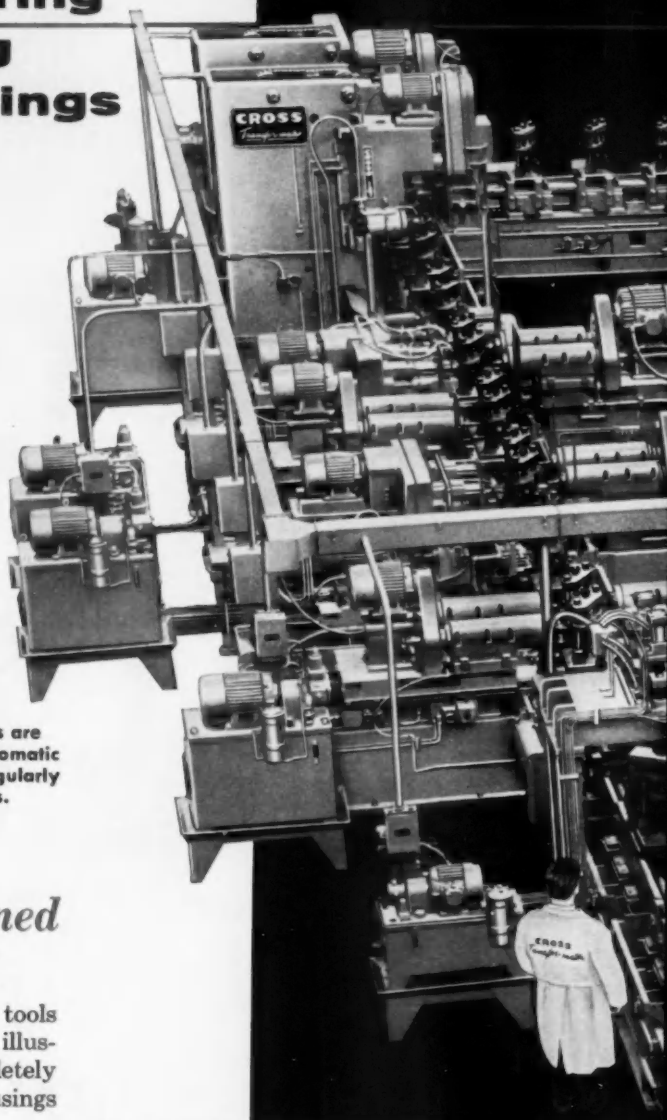
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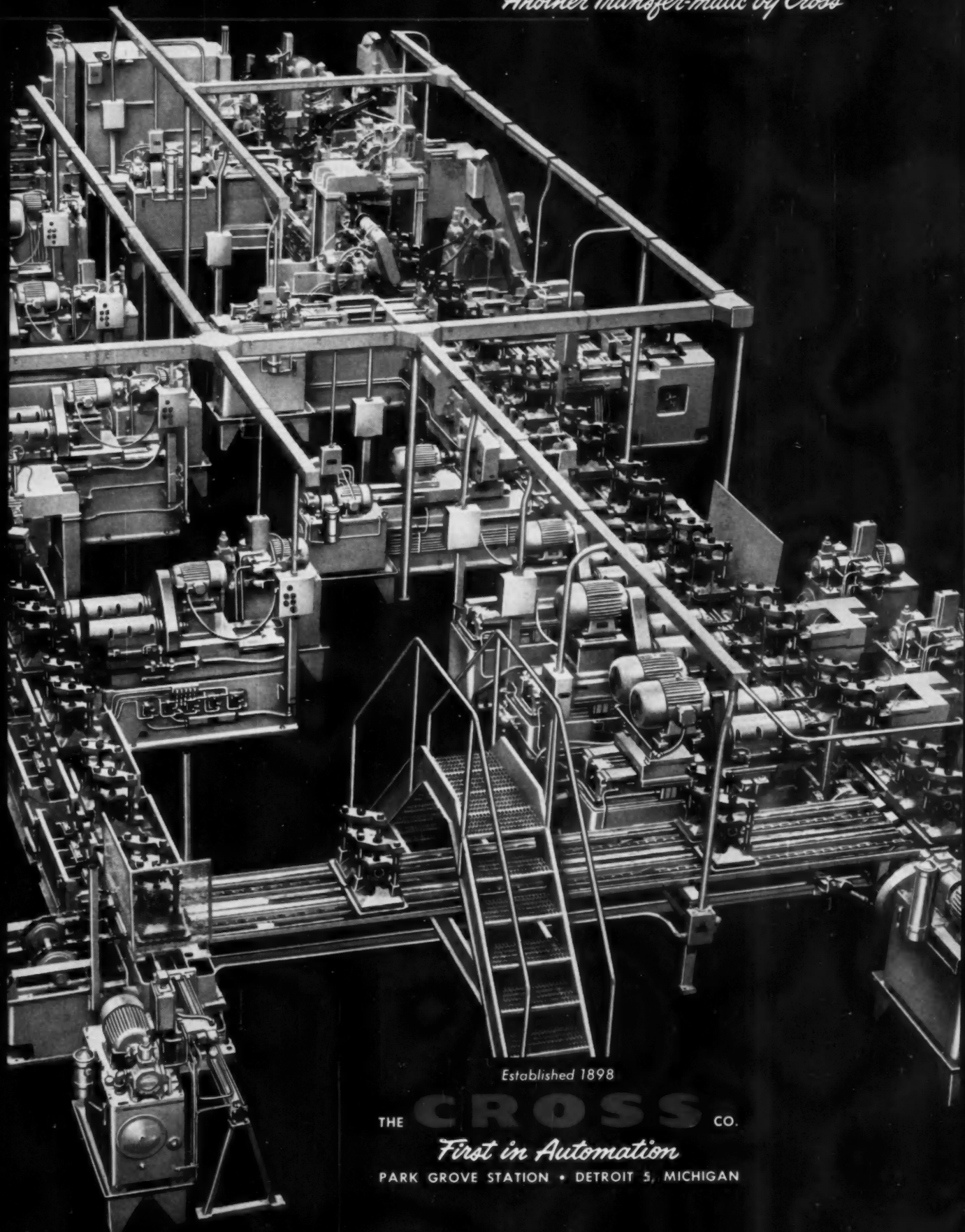
Another feature is the provision for in-line inspection at three different stations and final inspection just before the assembly operations.

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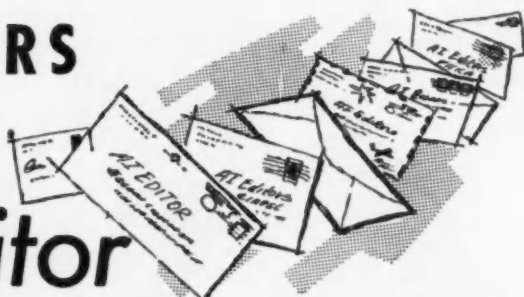
But let's talk about your application. Let's talk Chrysler workhorse power and let's talk price. Pick up the phone and call us.



LETTERS

to the

Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of **AUTOMOTIVE INDUSTRIES** are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, **AUTOMOTIVE INDUSTRIES**, 56th & Chestnut Sts., Philadelphia 39, Pa.

NEW VENTURE

Mr. George Walker has kindly brought to my attention the very wonderful article "Ford Styling at Work" in a recent issue of **AUTOMOTIVE INDUSTRIES**.

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● All of our technical and marketing facilities are open to you. Best of luck—Ed.

SMOG CONTROL

I noted your items on smog control and fuel cells in the February 15th issue of **AUTOMOTIVE INDUSTRIES**.

The enclosed report — "Motor Vehicle Created Air Pollution—A Control for California" is a good one, and the enclosed Technical Report of our District may prove interesting reading, especially Table 7.

Benjamin Linsky
Air Pollution Control Officer
Bay Area Air Pollution Control District
San Francisco, Calif.

SMALL ENGINES

We were pleased and impressed with your small engine article in

the March issue of **AUTOMOTIVE INDUSTRIES**. Your excellent editorial coverage did a bang-up job of introducing new engines to the readers of **AI**.

If possible, we'd like to place this article in the hands of our many customers and prospects in the original equipment field. Could you furnish at our expense 600 4-page reprints per the dummy attached?

David D. Carew
Advertising Dept.
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West Bend, Wisconsin

PLAUDIT

Publicity in **AUTOMOTIVE INDUSTRIES** is something the Webb Company has always been very proud and grateful to receive. A name mention from such an authority is a great boost to any promotional program.

Thank you for the courteous mentions in the past but, particularly for the one in the International Harvester story in your April 1 issue. We feel that this is a very fine installation and we are pleased to be recognized as one of the suppliers.

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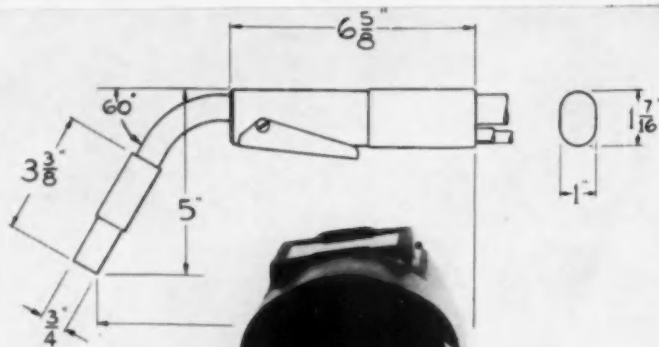


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Want to do a production job on steel 3/16" or less . . . economically . . . in any position . . . without edge preparation . . . no clean up and practically no spatter? Get the Aircomatic AH 30-A gun. • **Lower in price**, easier to handle, and more versatile than anything in its class, the Aircomatic AH 30-A is a nimble companion to the rugged AH 60-B gun. Its goose-neck nozzle gets it into the hard-to-reach places. Its expendable parts can be replaced with ease. Air-cooled — no plumbing! • **Wire feeder: any Airco type**, including the inexpensive AHF-D shown here. Wire sizes: the popular .035"-.045" diameters. Gases: argon, argon-O₂ mixtures,

money-saving CO₂ from the Pure Carbonic Co., and argon-CO₂ mixture. Rating: 300 amps DCRP CO₂ buried arc or 200 amps DCRP spray transfer.

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Roebbling... Your Product is Better for it

PHOTO BY MC MANUS

Let us help you save weight and space in your new designs with OTC high-pressure hydraulics

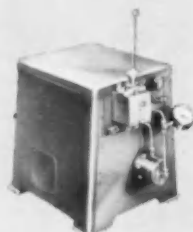
PUMPS



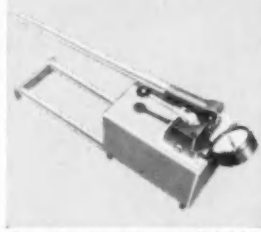
Two-stage "Vanguard" complete pumping units, in 6,000 p.s.i. and 10,000 p.s.i. models handle high force requirements yet provide fast ram approach and return (i.e. 600 cu. in./min. @ 100 p.s.i.). Portable — in electric or gasoline engine models. Many choices of controls and accessories.



High-volume, high-pressure radial-piston pump delivers up to 220 cu. in./min. at 10,000 p.s.i. Electric motor driven.



Two-speed hand pump (10,000 p.s.i.) delivers high volume in low pressure stage (7.3 cu. in./stroke up to 200 p.s.i.), yet provides needed low-volume power for high force needs.



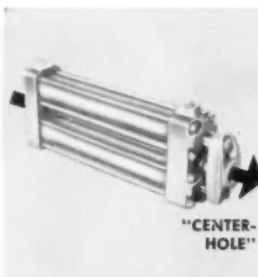
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Versatile, lightweight hand pump — single-speed, single-piston. Develops up to 10,000 p.s.i.



Double-acting cylinders with choice of stroke length. Bores 1 1/2" to 6 3/8", capacities from 8 to 150-tons at 10,000 p.s.i.



Double-acting "center-hole" cylinders with choice of stroke. Bores 1 1/2", 2", 2 1/2"; from 17 to 50-tons at 10,000 p.s.i.



"Power-Twin" single-acting "center-hole" cylinders. Capacities 17 1/2, 30, 50 and 100-tons at 10,000 p.s.i.

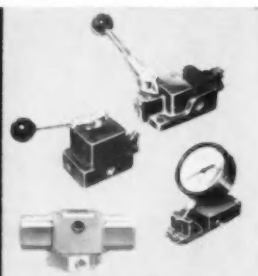


Single-acting cylinders. Bores 7/8" to 3 1/2", capacities from 2 to 50-tons at pressures up to 9,500 p.s.i.

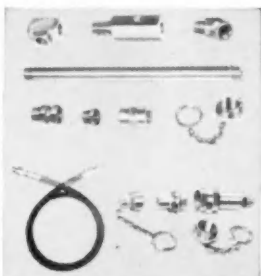


Special hydraulic cylinders made to order. We invite you to send us your high-pressure design requirements.

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hydraulic component, OTC's staff of experienced hydraulics engineers are ready to serve you. We request the opportunity to work with you in utilizing the benefits of high-pressure hydraulics in your special design programs. Write for complete information, and ask for our free "PHD" catalog.

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NEWS

Vol. 124, No. 9

May 1, 1961

New Model for Rouge Ford, Chevrolet Plan 4-Cylinder Engines

By James Dunne, Detroit Regional Editor,
and C. B. Campbell, News Editor

With sales and production schedules for 1961 returning to a more-normal level, more attention is focused on the 1962 models. Here are some expected developments:

Four-cylinder overhead valve engines for Chevy's new line of low priced cars. The engines will be produced at the Tonawanda engine plant.

Will Be Made at Rouge

Ford has been working on a four-cylinder in-line engine. Ductile iron will be used for the blocks.

Ford's new four-cylinder low, low priced car is expected to be made in Dearborn, Mich. Ford plans to move its Galaxie line from the Rouge plant to the Wayne, Mich., Mercury plant and assemble Comets and the new car at the Rouge.

The new model to be made at the Rouge plant will be either the "Canadian X" or "Canadian Y," according to Detroit reports. It is said to weigh about 2800 lb and will be slightly larger than Falcon and Comet models.

Ford officials have hinted that plans for the Cardinal, a new small car to compete against Volkswagen

and Renault, are far advanced and that a number of parts will be made in Europe.

Indications are that the Cardinal will be introduced this winter. There has been speculation it would be unveiled to Ford executives early next month after completion of most of the preliminary engineering.

Industry sources say the Cardinal will be built on a 90-in. wheelbase and will be powered by a four-

FIRST AMERICAN COMPACT CONVERTIBLE



Two door Rambler American convertible has appeared in U. S. dealerships. Built on 100-in. wheelbase, it is 173.1 in. long and 70 in. wide. Its six-cylinder overhead valve engine has 125 hp rating. Electric-hydraulic powered top is of fabric coated with vinyl. Plastic moldings along tops of doors will make it more comfortable for passengers to rest arms on window sills in hot sun.

cylinder water-cooled front mounted engine. It would accommodate four passengers.

Chevrolet's new car, now known as "Car H" among GM executives, probably will be a 114-in. wheel-base model. It is likely it will replace the Biscayne, Chevy's lowest priced model.

Chrysler is reported to be experimenting with a model for the small car market. Its air-cooled aluminum engine is said to be less than 100 cu in.

Fins will disappear from Chrysler and Ford lines. Plymouth will take on the lines of the Valiant.

At least two GM divisions will make extensive face-lifting changes.

Imperial will feature a semi-split grille similar to previous models.

Cutlass Convertible

Oldsmobile will introduce an F-85 Cutlass convertible.

Generally, the dimensions of the new cars will be slightly smaller.

Improved quality can be expected in all cars. Reliability and quality control programs are paying off. Troublesome components are being eliminated more quickly and new designs must pass rigorous testing

standards. The emphasis on quality has been passed on to suppliers on an "or else" basis.

The use of aluminum continues to gain. Bumpers, either anodized, polished or chrome-plated, are the next big target of the aluminum industry.

Three GM divisions have asked for price quotations on aluminum bumpers. They may be offered as optional equipment at extra cost on more than a few models.

With the new Rambler American convertible the only U. S. compact convertible now on the market, Detroit is expected to watch Rambler's convertible sales closely to learn if there will be a demand for this model.

If the public desires compact convertibles in large numbers, Detroit will waste no time in answering the demand.

Suslavich With S-P

Frank J. Suslavich has been named vice president and general sales manager of the Automotive Div. of Studebaker-Packard Corp.

He had been assistant general manager of the Plymouth Div., of Chrysler Corp.

Job Security Drive

Job security will be the major consideration for auto industry negotiators in bargaining talks this summer. Specific demands will be made for enlarged supplemental pay benefits, changes in seniority rules, earlier retirement age, and a salaried status (guaranteed annual wage) for hourly workers.

Because of the coolness of the Kennedy Administration to a shorter work week this demand will not be pushed, even though some locals are committed to obtain some kind of breakthrough.

The supplemental pay benefits would be enlarged to cover days not worked—during a short production week. This demand will be made of the Big Three so that all auto workers will be covered by it.

The demands for changes in retirement age and seniority rules are made in an attempt to move younger workers into the more secure, high seniority bracket and to provide more job opportunities. These two changes touch on sensitive areas and the union will probably encounter more resistance from its own members than from the auto makers.

Gets Battelle Post

Dr. John F. G. Hicks has been named associate director of Battelle Memorial Institute, Columbus, O. A chemist, Dr. Hicks formerly was vice president of Corning Glass works.

KING MIDGET IS NEWEST U. S. CAR



Weighing only 675 lb, the tiny King Midget has rear-mounted one-cylinder engine that achieves a top speed of 50 mph. Its makers claim 60 mpg.

NEWS

CONTINUED

New GM Glass Source

Pittsburgh Plate Glass Co. has announced receipt of an order to supply a portion of the glass required for 1962 models by the Fisher Body Div. of General Motors Corp.

Robinson F. Barker, vice president and general manager of Pittsburgh's Glass Div., said first deliveries will begin this summer.

No estimates have been made of the volume of business involved in the order, but industry sources declared it was "substantial."

The Pittsburgh order ends a 31-year rule by Libbey-Owens-Ford Glass Co. as exclusive supplier to General Motors.

In recent years, Pittsburgh's shipments to Ford Motor Co. and Chrysler Corp. have fallen as the

two companies used more of their own glass.

Pittsburgh also is a major supplier of automotive glass to American Motors and Studebaker-Packard.

Volkswagen Prices

Prices on some Volkswagen models have been boosted because of the increase in the value of the West German mark.

On the East Coast, the two-door sedan price has been raised \$30 to \$1,595. The two-door sunroof sedan is now priced at \$1,685, also a \$30 raise, and the convertible price is \$2,095, an increase of \$40. Higher West Coast prices remain unchanged.

Marmon Plans Trucks

Marmon-Herrington has announced it is going into the heavy truck business.

The 110-year-old concern made the Marmon Wasp with which Ray Harroun won the first Indianapolis 500 mile race in 1911.

David M. Klausmeyer said the company is testing a number of 14,000 lb models. They have both Diesel and gasoline engines.

The trucks will be built at the main plant in Indianapolis.

Hampson Promoted

R. J. Hampson, general manager, Transmission and Chassis Div., has been appointed general manager of Ford tractor operations.

The organization will coordinate the operations of the present Tractor and Implement Div. in the U. S. and the tractor operations now a part of Ford Motor Co., Ltd., Dagenham, England.

Succeeding Mr. Hampson as general manager of the Transmission and Chassis Div. is Robert Stevenson, who has been general manufacturing manager of the Engine and Foundry Div.

Willys Gets Contract

Willys Motors, Inc., has won a \$1,137,052 Government contract for 109 Jeep Universals, 197 utility wagons, 72 panel delivery units, 10 pickup trucks and 48 forward control trucks.

GORDINI INTRODUCED TO U. S. MARKET



Winner of numerous European economy runs, Renault's Gordini has 40 hp engine. In Italian run, it averaged 56.5 mpg.

NEWS

CONTINUED

Production Up 11 Pct.

Auto production for the week ending April 21 was estimated at more than 126,000, up 11 per cent from the previous week. All assembly plants were working to account for the highest output of the year.

Schedules for May are set at 515,000 cars, highest monthly rate for the year and about 70,000 units over the April total.

Production up to April 15 was 1,396,868 units, compared with 2,305,012 units in the same period last year. Of this total, General Motors produced approximately 53 per cent; Ford, 29 per cent; Chrysler, 10 per cent; American Motors, six per cent and Studebaker-Packard, one per cent.

Ford-Autolite Deal

Ford Motor Co. has purchased an Electric Autolite Co. battery plant and a spark plug plant. Use of the Autolite trade name and other assets were included in the \$28 million cash transaction.

Properties bought by Ford include a battery plant at Owosso, Mich., and a spark plug plant at Fostoria, O. Ford plans to continue both plants. No personnel changes are contemplated.

Included in the purchase are patent and license rights and the trade name "Autolite" except in Canada, Brazil and Venezuela. Electric Autolite will continue to distribute its products in those countries under the "Autolite" trade name.

Autolite will continue to supply spark plugs and batteries under its trade name to its original equipment manufacturing customers.

Ford will take over Autolite's sales organization of 340 for dis-

tributing spark plugs, batteries and electrical products in the replacement market.

Autolite will continue to make spark plugs at its subsidiary in Sarnia, Ont., and at another plant to be built at an undisclosed location in the U. S.

Chester Plant Sold

The closed Chester, Pa., plant of Ford Motor Co. has been sold to Reynolds Metals Co. for \$2.2 million.

Ford ended assembly operations of standard Ford cars at the plant March 15 and announced a new owner would be sought to provide jobs for displaced employees.

Richard S. Reynolds, Jr., president of the metals firm, said the plant would be used for manufacture of insulated wire and cable products.

Ward's Prediction

Jack Brabham, driving a Cooper Climax, will have no trouble qualifying in the "500" this year at Indianapolis, according to Roger Ward, 1959 "500" winner.

"He could finish fourth or fifth if he has no mechanical trouble," Ward said.

Brabham's car, a rear-engine job, is the forerunner of European Formula 1 machines which will appear in larger numbers next year. Ward noted that he had "turned three laps in the Cooper last year at an average of 130 mph" before he became familiar with its handling characteristics.

Eaton Cancels Move

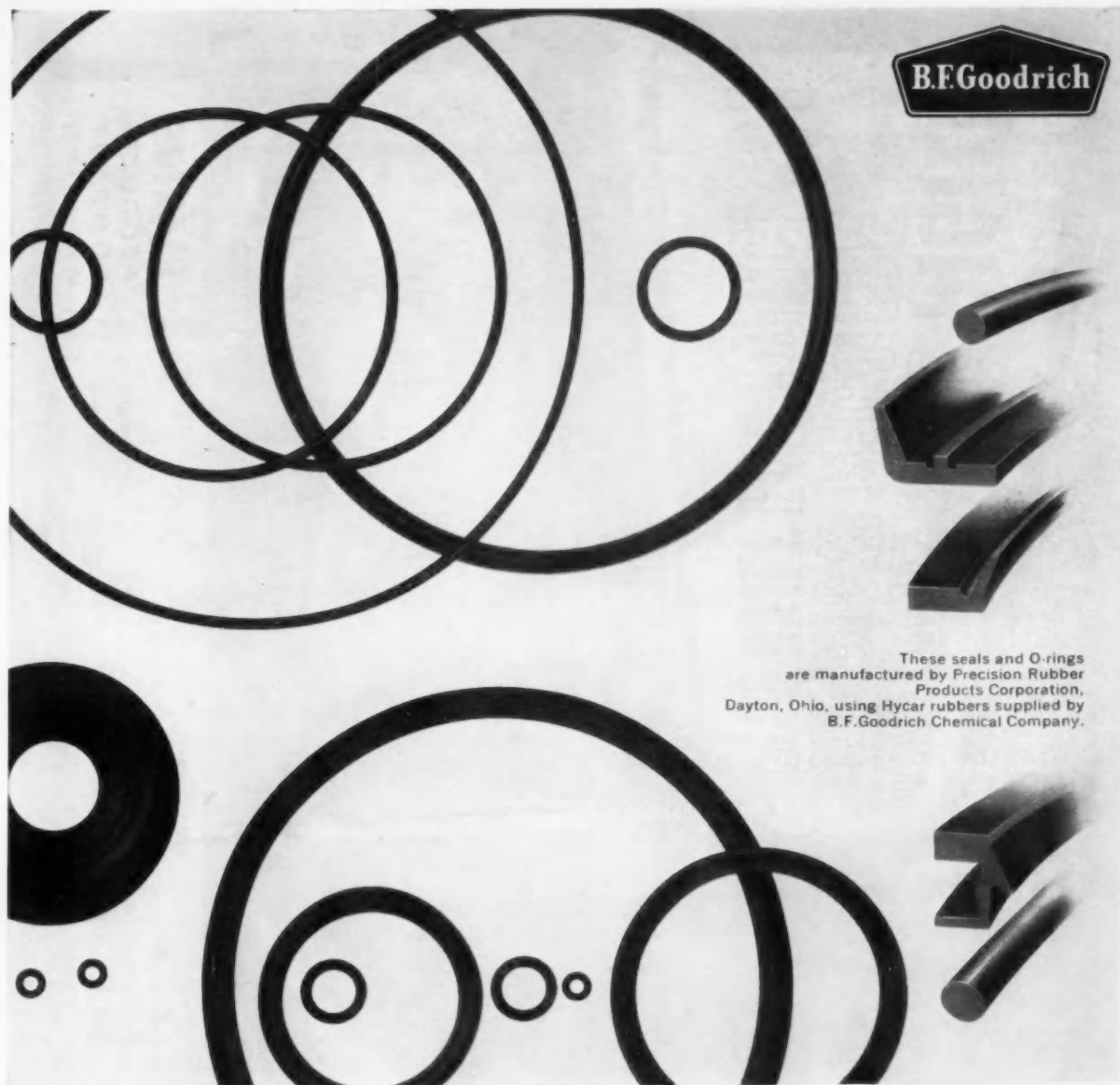
Eaton Mfg. Co. has announced it will not move its Reliance Div. plants to North Carolina for at least another year.

Eaton announced earlier it would move the division's two plants in Massillon, O., after workers there twice rejected a pay cut plan. The workers later reversed themselves and agreed to the cut.

ISRAEL'S SABRA SPORTS CAR



Only passenger car made in Israel has fiberglass body and four-cylinder 103.9 cu in. engine. The Sabra has 90 in. wheelbase, is 165 in. long, 50 in. high, 51 in wide and weighs 1750 lb. It is rated at 67 hp at 7800 rpm.



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Products Corporation,
Dayton, Ohio, using Hycar rubbers supplied by
B.F. Goodrich Chemical Company.

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effectiveness at high or low temperatures.

The wide variety of Hycar rubbers lets you make parts that are effective over a broad range of service conditions. To get more information about how you can use Hycar, write Department MK-3, B.F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

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HEATING AND VENTILATING DIVISION

NEWS

FEATURES

'Mr. Q,' 63, Heads Ford Dykstra Famed as Quality Control Expert

Horatio Alger had nothing on John Dykstra, new president of Ford Motor Co.

Born in Holland, Mr. Dykstra moved to Detroit shortly after the turn of the century and attended night sessions at Cass Technical High School.

That was the extent of his formal education, except for correspondence courses in foremanship at La Salle University.

With the trend at Ford toward youth, Mr. Dykstra's election as president came as a surprise to those close to the industry. His predecessor, Robert S. McNamara, was 44, when he resigned in January to become Secretary of Defense.

Chosen by Ford

Henry Ford II, board chairman, declared Mr. Dykstra "was my personal choice." "There never was a time we debated putting anybody in a position because of his age," he added.

Mr. Dykstra is known to his subordinates as "Mr. Q," for quality. He has been obsessed with this thought for most of his 44 years in the industry.

Mr. Ford stressed Mr. Dykstra's reputation for quality when he said, "The results Mr. Dykstra have obtained from the wide-reaching quality program he conceived and put into effect are a tribute to his

executive skills and a testimonial to the depth and breadth of his knowledge of our business."

Known at Ford as a hard worker and for long hours at his desk, Mr. Dykstra's average work day is from 7:15 A. M. to 6 P. M.

While he likes tulips from his native Holland, he prefers roses, which he cares for like an expert at his home in Birmingham, Mich.

Apprentice Die Maker

Ford's new president started in the automobile industry as an apprentice die maker and after World War I joined a company later pur-

chased by Hudson Motor Car Co. He helped Hudson organize its body plant and was plant manager of sheet metal and body fabrication and assembly before moving to the Oldsmobile Div. of General Motors in 1934.

He was manufacturing manager when he left Oldsmobile after 13 years to join Ford in 1947. He has been a Ford vice president since 1950.

Ford Promotes Ponta

Appointment of Peter H. Ponta, 43, as director of Ford Motor Co.'s Manufacturing Staff has been announced by John Dykstra, president.

Mr. Dykstra held the position of vice president-manufacturing prior to his election as Ford's president.

Mr. Ponta had been director of the manufacturing engineering and development office since October, 1960. Prior to that he served as general manufacturing manager for Ford's Engine and Foundry Div.

Mr. Ponta joined Ford in 1937 as an apprentice draftsman and later served as a design engineer in various operations of the car engineering department. In 1943, he became supervisor of design and development for the Ford M-26 tank engine and, in 1945, was named chief resident engineer for the Rouge plant. He was transferred to Dearborn Engineering

(Turn to page 27, please)



John Dykstra

AI TABLOID

Various ceramic coating systems for tungsten metal have been developed for the Air Force. The systems, which include silicide coatings, ceramic crystals in a glass matrix, and zirconia-clad coatings, are described and evaluated in a research report.

Partial constitutional diagrams established for 16 binary systems containing rare earth metals, and a discussion of the tensile, compression, fatigue and impact properties of these metals and their alloy systems, are presented in two Air Force research reports.

Development of a potential successor for the standard vaporizer used by the Air Force to supplement mechanical protein foam is reported in one of three chemical products research reports. Two others discuss the value of mineral oil as a storage preservative for brake wheel cylinders, and chemical degradation of high temperature hydraulic fluids in a high pressure circulation loop.

Measurements comparing conventional machine tools with those using radioisotope activated techniques provide a reasonably precise indication of wear rates. It is doubtful, however, if this data can be used to estimate the tool's total performance, states a research report published by the Atomic Energy Commission.

An improved technique for testing the fatigue life of metals used in aircraft construction is reported in an Air Force-sponsored study. Three other reports discuss irradiated steels and weld metals; strain rate on aluminum-zinc alloys; and stainless steel and titanium alloy creep tests.

Iron and steel companies plan to spend approximately \$1.2 billion this year in new equipment and construction in order to meet tomorrow's trends.

A new selective bibliography listing U. S. government research reports, translations, and other technical documents on fuel cells and related research has been released to industry and the public.

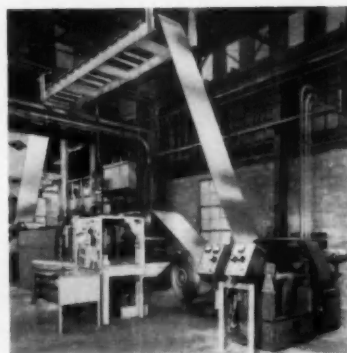
Soviet research in the oxidation of metals and alloys is described in one of six articles translated from Russian trade journals. The translations have been released through the Office of Technical Services, Business and Defense Services Administration, U. S. Dept. of Commerce.

A new group of materials with ferroelectric properties has been discovered by researchers seeking digital computer elements that can be used at high temperatures. Named "ferrielectrics," the new materials are described and evaluated in an Air Force research report.

Rising demand in the United Kingdom and West Germany pushed U. S. exports of crude aluminum to 570 million lb in 1960, more than double the 1959 total of 242.2 million lb. Shipments to the United Kingdom were up 115 per cent, from 110.1 million lb to 236.2 million lb. West German purchases advanced 302 per cent, from 37.6 million lb to 151.2 million lb. Shipments also increased to France, Yugoslavia, Japan and The Netherlands.

Facilities for the treatment of hard to lubricate components with "Surf-Kote," a permanent, solid dry-film lubricant, are now available at the Long Island, N. Y. and Manhattan Beach, Calif., plants of the Startos Div. of the Fairchild Engine and Airplane Corp.

Soviet advances in the development and use of synthetic materials are reported in a translation of Russian chemistry literature discussing current technological progress in the USSR.



Vertical furnace, installed in Electric Furnace Co.'s research and development laboratory, will bright anneal 1500 lb hourly of 24-in. wide stainless steel strip at temperatures up to 2100F.

Plastics Conference

The Society of Plastics Engineers will hold a regional technical conference on "Plastics for the Automotive Industry" on May 9 in Detroit.

Six representatives of Ford, General Motors, Chrysler and American Motors will be among the featured speakers. Representatives of supplier companies will discuss the history and applications of plastics in the automotive field.

The conference, which is expected to attract some 500 persons in the automotive and plastics industry, will feature a talk by Robert McLean, executive in charge of automotive research design at General Motors Technical Center.

Daubert Elected

D. H. Daubert, manager of the J. I. Case Co. Product and Market Research Div., has been elected chairman of the Agricultural Research Committee of the Farm Equipment Institute.

(Continued from page 25)

Staff in the following year as supervisor of production engineers.

After participating in Ford's supervisory production management training program, he became manager of the quality control department, Automotive Manufacturing Operations, in 1948. He was appointed manager of engine manufacturing, Engine and Foundry Div., in October, 1952. He was general manager of the former Engine Div. from January, 1957, until the new Engine and Foundries Div. was formed in April, 1958.

Mr. Ponta attended the Henry Ford trade school, and later received a bachelor of science degree in mechanical engineering from the Detroit Institute of Technology and a bachelor of science degree in industrial management from Wayne State University.

Mr. Ponta is a member of the Society of Automotive Engineers. He is married, has one child, and lives at 33 Shady Hollow Drive, Dearborn, Mich.



Peter H. Ponta

AUTOMOTIVE INDUSTRIES, May 1, 1961

'Driving Simulator'

The Automotive Safety Foundation has urged development of a "driving simulator" as a major contribution to highway safety.

J. O. Mattson, president of the non-profit organization, said in his annual report to the group's 600 sponsors that a simulator would make possible important research in driver behavior and the design of highway and motor vehicles.

The device, operated electronically, would reproduce for the motorist all the sights, sounds and other sensations involved in driving a car, Mr. Mattson said.

He added that recent scientific developments and work on simulators in connection with military research may make it possible to devise a driver simulator. This, in turn, he pointed out, would permit study of human causes of accidents.

Mr. Mattson disclosed that last year the safety group made \$740,000 of grants to further traffic safety and highway development. The money went to 25 educational institutions and public service organizations.

S-P Diesel Trucks

Studebaker-Packard Corp. will produce the first line of medium duty trucks and tractors equipped with basic, unconverted Diesel engines on the United States market, L. E. Minkel, vice president of marketing, has announced.

"These models represent a new concept of transport vehicle, as promising in the truck field as was the recent appearance of compacts in the passenger car market," Mr. Minkel said. "Their introduction is the result of substantial market research which shows an immedi-

ate and growing demand for medium duty Diesel trucks."

Production of the new trucks is scheduled to begin in June. They will be rated at 19,500 and 23,000 lb gross vehicle weight, and 35,000 and 41,000 lb gross combination weight.

The Diesel power plants will be 4-53 four-cylinder engines manufactured by Detroit Diesel.

U. S. Exports Lagging

The United States makes more than one-half of all the motor vehicles manufactured in the world, but West Germany, Great Britain and France export a larger number and Italy is moving up.

World-wide production figures as compiled by the Automobile Manufacturers Association show that world production in 1959 was 13,916,125 units of which the U. S. portion was 7,723,554.

In the same year, West Germany exported 870,817 passenger cars, trucks and buses; Great Britain, 696,937; France, 603,248; United States, 266,318; and Italy, 221,194.

In 1959, the United States was the largest importer, bringing in 668,070 passenger cars and 22,763 trucks and buses.

Ford Tractor Parley

Some 200 delegates from 30 countries gathered in Puerto Rico to attend Ford Motor Co.'s international tractor and implement conference, largest agricultural and industrial machinery meeting ever to be held in the Latin American-Caribbean area.

The conference marked the formal export introduction of the new Ford 6000 Diesel tractor and its range of implements.

HOW ALLIS-CHALMERS FUEL CELL WORKS

chemistry of the fuel cell

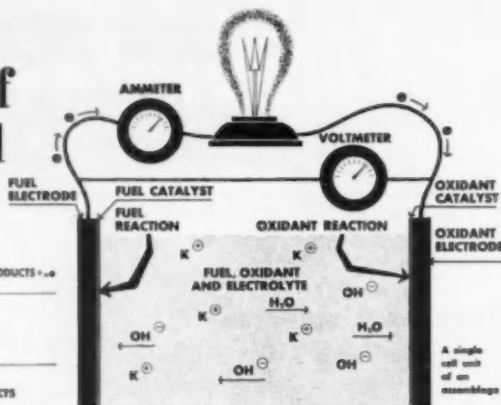
1/2 CELL REACTION AT THE ANODE
 $\text{ALCOHOL} \rightarrow \text{H}_2\text{O} + \text{OXIDATION PRODUCTS} + 4e^-$

ALCOHOL AT Pt CATALYST:
 $\text{C}_2\text{H}_5\text{OH} \rightarrow \text{H}_2\text{O} + \text{OXIDATION PRODUCTS} + 4e^-$

1/2 CELL REACTION AT THE CATHODE
 $\text{H}_2\text{O}_2 + 2e^- \rightarrow 2\text{OH}^-$

At Ag CATALYST:
 $\text{HYDROGEN PEROXIDE} \rightarrow 2\text{OH}^-$

OVERALL CELL REACTION:
 $\text{ALCOHOL} + \text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{OXIDATION PRODUCTS}$



Allis-Chalmers Mfg. Co. has made available for instructional purposes a working model fuel cell which turns chemical energy into electrical energy. The fuel cell consists essentially of electrodes and an electrolyte. When gases such as hydrogen and oxygen are fed into the cell, electrons are released at the anode. The stream of electrons, in passing through an external load, produces electrical energy in the form of direct current. Electrons from the external circuit react with the electrolyte at the cathode and reform the ion which was used up at the anode, thus completing the fuel cell circuit.

\$4.2 Million for Ford

Ford Div. of Ford Motor Co. announced it has been awarded two government vehicle contracts totaling \$4,243,821.

The Ordnance Tank Automotive Command contracts are for 1137 Fairlane sedans, 542 conventional cargo trucks, and 257 four-wheel drive cargo trucks.

Nine Ford assembly plants will share in the Fairlane contract. Plants and amounts involved are St. Paul, Minn., \$93,498; Atlanta, Ga., \$202,071; Dearborn, Mich., \$51,327; Dallas, Tex., \$150,329; Los Angeles, \$246,920; Louisville, Ky., \$54,091; Norfolk, Va., \$63,514; Mahwah, N. J., \$623,705, and St. Louis, \$110,046.

The truck chassis will be assembled at Ford's Chicago, Mahwah and San Jose assembly plants. Delivery of cars and trucks will begin May 3 and June 3 respectively.

Continental Contract

Residents of the Muskegon, Mich., area received good news in the form of a \$17.4 million Army contract to Continental Motors Corp. for continued production of tank engines.

The award was made by the Detroit Army Ordnance District and covers procurement of 793 Diesel engines to power M-60 tanks plus 221 fuel injection gasoline engines to power 180 M-88 tank recovery vehicles. The award includes spare parts, inspection equipment, and engineering support for the engines.

Col. J. E. Johnston, commander of the Ordnance District, said the order will mean continued employment for 1000 workers.

Military VTOL Designs

The Bureau of Naval Weapons has received competing designs for a vertical takeoff and landing military transport. The plane would be used by all three services.

Specifications call for a craft capable of cruising at 280 to 400 mph over a radius of 225 to 335 mi with a payload of 8000 lb.

Engineers say if a design is approved, it may be used for civilian purposes and would carry 40 passengers. Such a plane, they say, could land or take off from small landing fields in or near downtown areas of large cities, eliminating most of the time to and from outlying airports.

Billion Jet Project

Lockheed Aircraft Corp. has been selected by the Air Force to develop and produce 100 new high-speed jet cargo and troop-carrying planes.

Lockheed will build the plane at Marietta, Ga. The contract provides that at least half the work must be subcontracted to other firms.

Delivery of the first military transports is expected in the fiscal year ending June 30, 1965. The current budget slates \$30 million for the project while \$98 million is planned to be spent in the next fiscal year. First test flights are expected in 1963.

The new jet transport known as SOR 182, will be powered by four jet turbofan engines. It will have a speed of 440 to 500 knots an hour and its range will vary from 3000 mi with a 60,000-lb. load to 5500 mi with a 20,000-lb load.

It will have a full-width rear loading ramp for bulky cargo. The pressurized cabin will permit carrying troops at 25,000 ft and above.

Hustler Computers

Flight control systems and air data computers for the world's fastest bomber, the B-58 Hustler, will continue in production in Detroit under a new contract award totalling \$27 million, it was announced by the Bendix Corp.

Milo F. McCammon, general manager of the Eclipse Pioneer Div., said the contracts include \$23 million for the complex control systems and \$4.3 million for conversion of earlier Hustlers as trainer bombers.



Extra durability of thicker chromium plate now proved by test of time

ACCELERATED corrosion tests such as CASS* and Corrodokote† consistently show that the thicker the chromium which is plated from M&T processes over a proper nickel undercoat, the more dramatic the increase in resistance to corrosion.

These modern, severe laboratory methods used by automotive engineers quickly evaluate outdoor life expectancy of bright finishes. But how about the test of time—would results follow the same pattern?

They have. Results after long, outdoor exposure in Detroit and Kure Beach tell the same story. Thousands of chromium plated steel and zinc die cast sample panels add their weight to the same conclusion: single or duplex deposits of M&T MICRO-CRACK

CHROMIUM, plated thicker than usual specifications, greatly increase durability.

These deposits are produced with SRHS* Chromium Baths—which plate with higher speed than the ordinary chromium bath, and self-regulate themselves for optimum results. SRHS Baths cover complicated shapes more uniformly, reduce problems of plating newly designed parts.

An M&T plating engineer is ready to explain this chromium to you, and recommend your best choice for current production or for 1962 models. Call him in.

*CASS test: copper-accelerated acetic acid salt spray.

†Corrodokote test: a standard, uniform, highly corrosive slurry is applied on test piece, which is then placed in non-condensing humidity cabinet.



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MEIN

IN THE NEWS



Oliver Corp.—John H. Mangle has been elected vice president-operations.



Auto-Load Machine Co.—Harry J. Jacob, Jr., has been appointed chief engineer.



General Motors Corp., GMC Truck & Coach Div.—Norman F. Trost has been named assistant director of reliability.



Dura Corp.—D. Edward Weston, Jr., has been named director of marketing, consumer and industrial products.



Humble Oil & Refining Co., Esso Standard Div.—James H. Lumpkin, Jr., has been named manager of the Automotive Div.



Champion Rivet Co.—E. J. Markert has been promoted to vice president-manufacturing; William F. Dempsey has been appointed Forging Div. manager, and Donald J. Schaefer has been named Welding Div. manager.

General Motors Corp., Delco-Remy Div.—E. A. Black has been promoted to purchasing manager; Claude R. Moneyhun has been named manager of value analysis, and George T. Hitz has been appointed purchasing agent for the Anderson, Ind., plants.

Highway Trailer Industries, Inc., Defense Products Div.—George P. Knudsen has been named manager.

Firestone Tire & Rubber Co.—C. M. Barnes has been named president of the Dayton Tire & Rubber Co., a subsidiary.

Eaton Mfg. Co.—Quenton N. Groth has been appointed president of Eaton Ejcs, S. A. I. C., Argentine subsidiary.

Ford Motor Co., Ford Div.—William P. Benton has been promoted to manager of car sales promotion and training dept.; Blair F. Scanlon has been appointed national used car manager, and Douglas A. Holmes has been named fleet merchandising manager.

Interstate Drop Forge Co.—Werner G. Bartell has been promoted to secretary and Franklyn Esenberg has been appointed controller.

Chrysler Corp.—C. S. Keller has been appointed manufacturing manager of the Kokomo casting plant; Frank O. Anderson, II, has been named plant manager of the American Foundry plant, and W. C. Hanway, Jr., has been promoted to assistant director-fleet sales.

Standard Screw Co., Chicago Screw Div.—Edward A. Smith has been promoted to chief product engineer.

Highway Trailer Industries — Seward E. Biggs has been named vice president in charge of manufacturing.

Holcroft & Co.—Donald J. Schwalm has been promoted to chief metallurgist.

Ford Motor Co., Engine and Foundry Div.—E. C. Jeter (far left) has been promoted to general manufacturing manager and W. E. Goudey has been named manager, Dearborn Iron and Specialty Foundries.

Ford Motor Co.—Leo W. Tobin, Jr., has been named executive assistant to the vice president-manufacturing.

General Motors Corp., Defense Systems Div.—Stanley W. Connelly has been named chief of the Market Analysis Section.

Hyster Co.—Glenn Herz and James L. Woodley have been elected vice presidents.

Dura Corp.—Lee Struble has been promoted to corporate master mechanic.

Aluminum Co. of America, Development Div.—James M. Smith has been appointed development manager, transportation.

American Oil Co.—Robert W. Olsen has been promoted to senior project automotive engineer and Thomas M. O'Grady has been named project chemical engineer.

Necrology

William A. Stewart, 73, retired purchasing agent for the Lincoln-Mercury Div. of Ford Motor Co., died April 13 in Detroit.

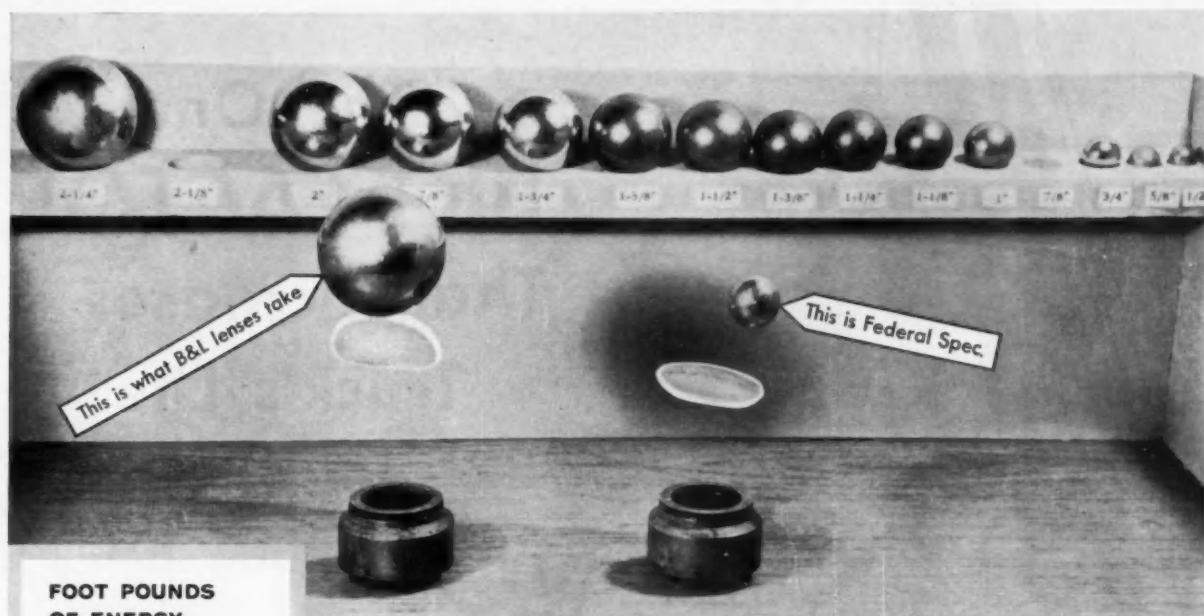
George Walther, 85, president of the Dayton Steel Foundry, and maker of a cast iron wheel which played a part in development of the automobile industry, died April 10 in Dayton, O.

Clyde W. Clark, Sr., founder and president of the Dearborn Tool & Die Co., died April 7 in Ann Arbor, Mich.

Hubert C. French, 78, retired managing director of the Ford Motor Co. in Australia, died April 4 in Melbourne, Australia.

George D. Hutson, 90, former comptroller and assistant treasurer of the Hudson Motor Co., died March 30 in Detroit.

Herman J. Tonn, vice president and co-founder of the Chicago Rivet & Machine Co., Bellwood, Ill., died March 17 in Elmhurst, Ill.



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In the picture above, you see two bouncing steel balls stopped in mid-air by the high speed camera. The balls were dropped simultaneously from a height of more than 4 feet. Federal Standards Bureau specification for safety lens impact resistance requires exactly this test, using the $\frac{7}{8}$ " diameter steel ball you see on the right. Truth is, B&L Bal-SAFE lenses withstand impact from 2 to 10 times greater than Federal specification.

By B&L standards, every lens must withstand the shock of a $1\frac{1}{8}$ " diameter steel ball, or twice the impact of the $\frac{7}{8}$ " ball. This extra safety is engineered through a special B&L lens toughening process that adds *not a penny* of extra cost to you.

Ask your safety man: "how much eye protection are we now getting—and are we getting all we might bargain for?"

A representative from one of the 314 suppliers of B&L Safety Products in U.S. and Canada will show you the many pluses in protection awaiting you all through the B&L lines—and vision screening for safer, more productive use of eyes on the job by means of the famous B&L Industrial Ortho-Rater.

Why shouldn't superior eye protection be an achievement of Bausch & Lomb? World leaders in ophthalmic research, with the only glass plant in the Western Hemisphere devoted exclusively to manufacture of optical glass, Bausch & Lomb leads in all forms of eyesight conservation.

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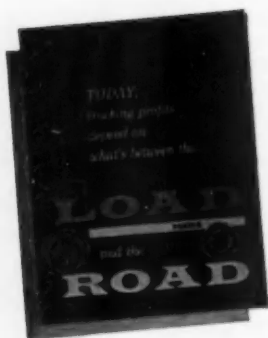
Please send SAFETY PORTFOLIO "Helpful Hints for the Man Responsible for Safety."

NAME TITLE

COMPANY

ADDRESS

The One BIG FACTOR That Increases A Truck's Life!



For the complete story on Parish heat-treated alloy siderails, write for the interesting, illustrated booklet—"Load and the Road."

Commercial vehicles — from off-the-road loggers to transcontinental vans — are being designed to carry heavier loads farther at a faster pace. And the BIG FACTOR that means longer life for many of these vehicles is extra-strength Parish siderails.

Parish alloy steel siderails are 277% stronger than ordinary carbon steel. Made of heat-treated chrome manganese molybdenum steel, they're the finest combination of modern materials and design know-how. They mean

extra strength without extra weight.

Parish siderails absorb shock better, hold their shape better, than do conventional siderails. Misalignments caused by frame warping are almost non-existent. Drive train components last longer. Maintenance costs and downtime are reduced.

That's why some 30 leading truck and trailer manufacturers are now designing their vehicles around Parish heat-treated siderails—the *extra strength* siderails that stay aligned.

PARISH PRESSED STEEL



DIVISION OF DANA CORPORATION • READING, PENNSYLVANIA

NEEDED . . . a Positive Program for American Industry

an Editorial



EVERY ONCE IN A WHILE it looks as if our entire country has forgotten that jobs and profits are produced by industry and not by restrictive laws. Lately the crop of strange new legislative proposals seems to have emerged from the idea that if the country puts more restrictions on industry, the result will be the production of more jobs and profits. Such proposals deserve the most careful scrutiny by everyone.

FOR EXAMPLE: IN RECENT MONTHS a number of large corporations have been severely penalized for quoting identical prices. Now, in contrast to the laws which have considered identical prices as indicators of monopoly practices, another law has been proposed which has for its purpose the requirement that all prices for similar products be identical.

FOR EXAMPLE: IN PREVIOUS YEARS it has been considered that competition in innovations of design lead to improved values and services to the public. Now a strange new law is proposed which would freeze specific design concepts into a pattern

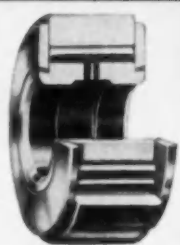
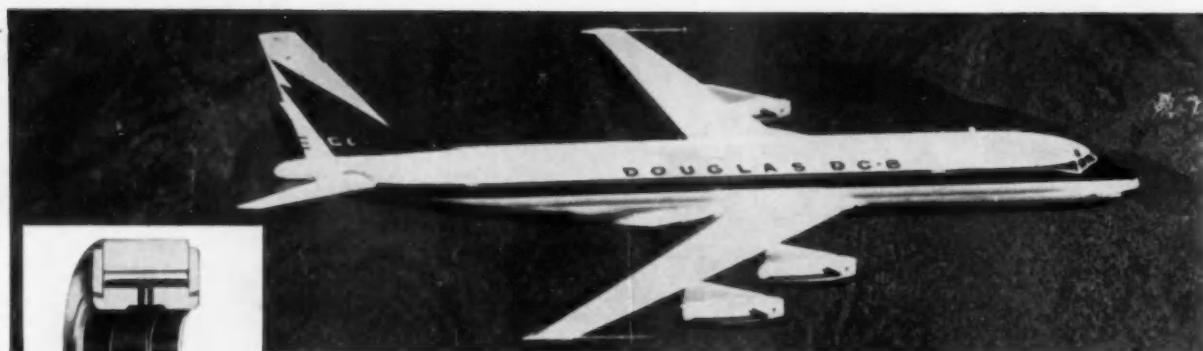
which could be changed only by enactment of some additional legislation.

THERE ARE MANY OTHER EXAMPLES which could be cited by anyone who has kept up-to-date on new legislative proposals in Washington. All such proposals have been studied and passed along to committees for further analysis. Most of the proposals are based on the proposition that anything can be managed more effectively if there is some new law to cover every prospective move of enterprise.

THESE PROPOSALS ARE NOT INDICATIVE of progress. Actually, they indicate a very undesirable form of reactionary control. They aim to curtail freedom, not to enlarge it. They indicate merely that there still is a need for a positive program for American industry which will be understood by everyone.

IT IS NOT ENOUGH to have freedoms in international relations, in labor relations, and in advancement of health and education. America's program must also include dynamic, positive programs for advancement of freedom of enterprise.

H. W. Barclay
Editor and Publisher

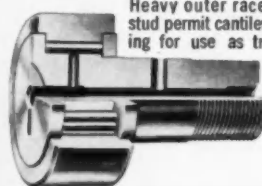


Extra heavy outer race for heavy rolling loads. Also available in double row type.

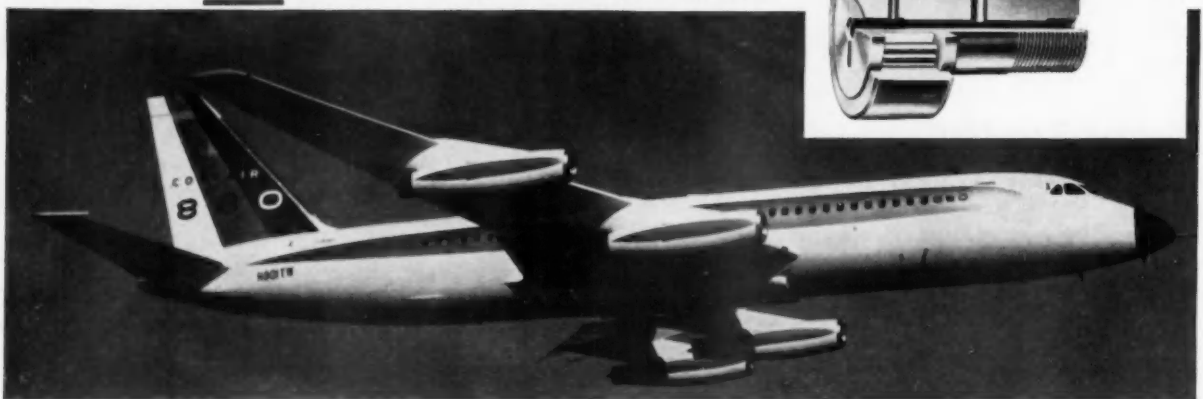
JET AHEAD WITH TORRINGTON BEARINGS—



ON ALL THE GREAT NEW JETS



Heavy outer race, integral stud permit cantilever mounting for use as track roller.



Specially designed to withstand heaviest rolling and shock loads, Torrington Track Rollers and Cam Followers are at the heart of take-off and landing procedure on all the new commercial jets.

Tremendous speeds and carrying capacity of jet aircraft impose heavier than ever loads on the flaps, yet their operation must be smooth, efficient, 100% sure. Torrington engineers developed larger, tougher track rollers and cam followers...bearings specially designed for performance

and the utmost in dependable commercial jet service.

Track rollers and cam followers, compact and light in weight, offer maximum radial capacity in minimum cross section. A full complement of small diameter rollers insures minimum starting and running friction.

Torrington aircraft bearings are manufactured to the highest standards in the industry. For further information or application assistance, write or call Torrington—maker of every basic type of anti-friction bearing.

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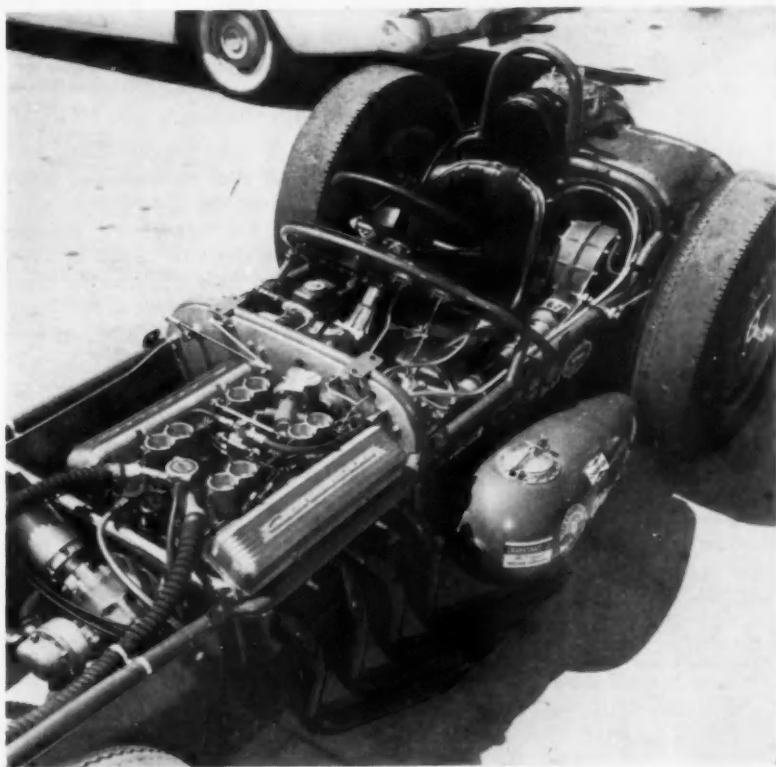
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Modified
Corvette Engine
in Chuck Chenoweth car
has been fitted
with cylinder sleeves
to reduce
piston displacement
to 255 cu in.



CHENOWETH CAR

By
R. Raymond Kay

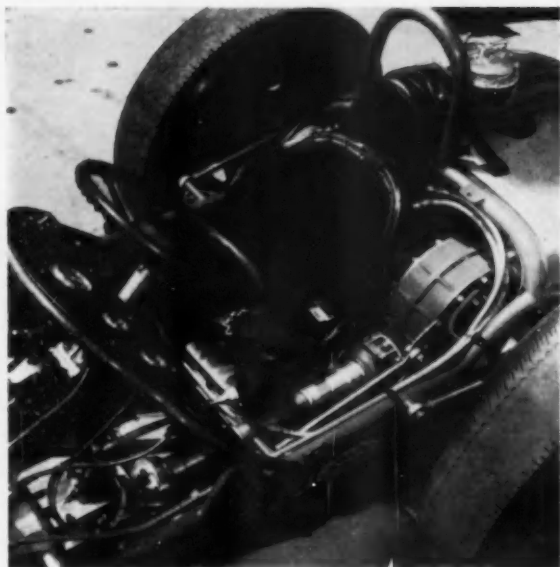
PACIFIC COAST
EDITOR

"GENTLEMEN, start your engines!" This command will start 33 of the world's fastest cars and drivers chasing each other.

Event—the golden anniversary of the 500-mile race at the Indianapolis Motor Speedway, May 30.

Everything is in high gear for the fastest race in Speedway history. Over 175,000 lucky ticket holders will see many of the finest racing machines. Champs, veterans, and rookies will be in there driving for gold and glory.

More power, more speed, and more cars at the finish. That's how it looks to this reporter. Pace will be fast—fastest of all the 500's.



CHENOWETH CAR

Cockpit of the Chenoweth car which is equipped with a modified Corvette engine.

Barring accidents, and with favorable weather and a good track, speed for the race should average 140 mph—a new high.

Some 60 cars will try for the 33 prized starting positions. Most of them are Frank Kurtis and A. J. Watson built. All but two or three will mount the Meyer & Drake 255-cu-in. Offenhauser engine.

The M&D engine is affectionately dubbed "Old Reliable" and "Old Workhorse." And there's good reason. Year in, year out it powers nearly all of the cars at the Speed-

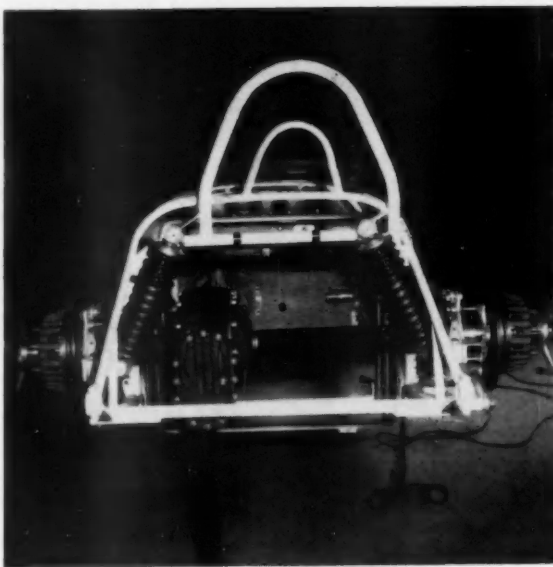
way. And year in, year out it delivers the goods.

Quite a few owners are considering power steering. Back in 1954, nine or ten cars came to the track with it. But it wasn't used. Why? Too many mechanical bugs. If anyone uses power steering this year, it will be an Indianapolis first.

Keep your eyes on the Cooper-Climax. This British-made car will have Jack Brabham in the driver's

DEAN VAN LINES SPECIAL

Dean Van Lines Special. Meyer & Drake laid-over engine protrudes beyond left side of frame.



LEADER CARD SPECIAL

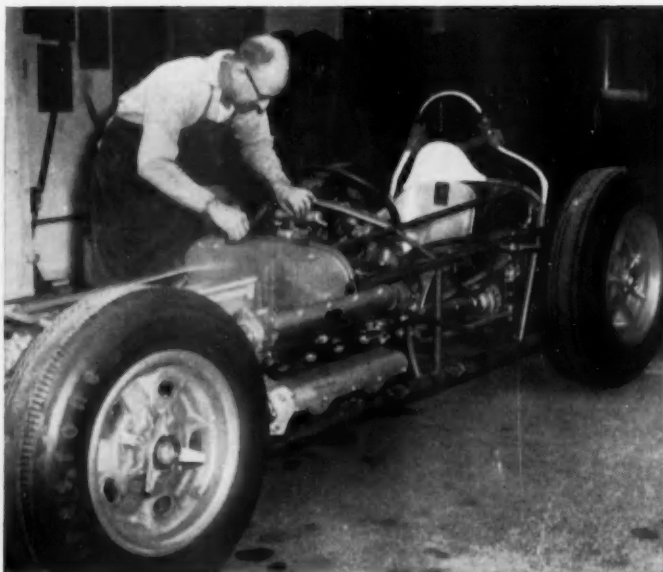
Rear view of one of the two new Leader Card Specials. The car has coil springs and Monroe shock absorbers on all four wheels, Halibrand spot disk brakes, and built-in air jacks.

seat. He's the world's auto racing champ.

The Cooper-Climax is of rear-engine design. It's similar to the one which Brabham used to lap the Indianapolis track at speeds up to 144.834 mph during trial runs last fall.

Brabham's car is powered by a 4-cyl Climax non-supercharged engine with a 3.78-in. bore and a 3.74-in. stroke for a piston displace-

Builder Eddie Kuzma at work in his Los Angeles shop on a Dean Van Lines Special.



ment of 167 cu in. This is about 88 cu in. smaller than M&D's Offenhauser engine. But it's 10 per cent larger than the one with which he made his test runs.

The power-to-weight ratio of the British entry compares favorably with U. S. cars. It's some 600 lb lighter. Just in case, a second Cooper-Climax is in reserve.

John Zink's Trackburner is another rear-engine car in this year's race. It's the first U. S.-made car of rear-engine design entered at Indianapolis since the Rounds Rocket Special failed to qualify in 1949.

Zink had planned to use Boeing Airplane Company's gas turbine engine. But there wasn't enough time to solve some of the engineering problems. So the car will have the M&D engine.

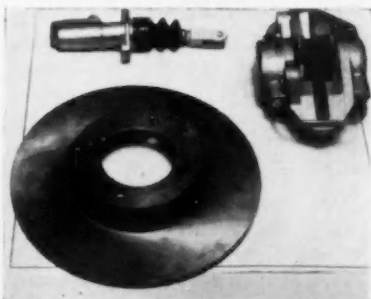
San Diego builder Chuck Chenoweth plans a Chevrolet engine for an otherwise conventional racer. The powerplant is a 283-cu-in. Corvette V-8, sleeved down to 255 cu in., the maximum allowed under Indy rules.

Some engine parts: Grant pistons, chrome vanadium rods, stock hard-chromed crankshaft by The Crankshaft Co. Also Iskenderian roller cams and Hilborn fuel injectors. Compression ratio: 14.5:1. Highly stressed engine parts were shot-peened and magnifluxed.

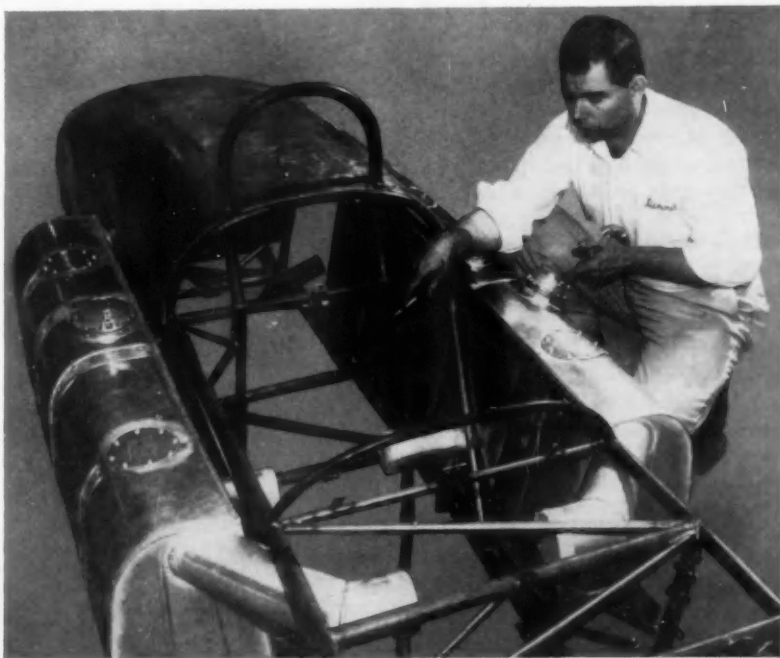
Other features include special valves with 1½ in. exhaust and 2-in. intake. The car has a Scintilla magneto with a Lehman V-drive.

(Continued on next page)

JOHN ZINK TRACK BURNER SPECIAL



Components of the Girling disk brake on John Zink Trackburner Special.



New John Zink Trackburner Special which will have rear engine. The car is similar in design to Cooper Formula 1 car appearing at Indianapolis this year.

COMPACT RACE CARS?

AUTOMOTIVE INDUSTRIES interviewed two Indy greats: Lou Meyer, three-time winner and head of Meyer & Drake, makers of the Offenhauser engine; and Frank Kurtis, master-designer and builder of 124 Indy racers.

Lou Meyers says, "There's certainly a tendency to small engines. I welcome any rule changes that are best for racing. But we need two or three years of lead time to develop and build a smaller engine. A lot hinges on how the Cooper-Climax does in the race. If it does terrific, I believe we'll see smaller engines at the Speedway soon."

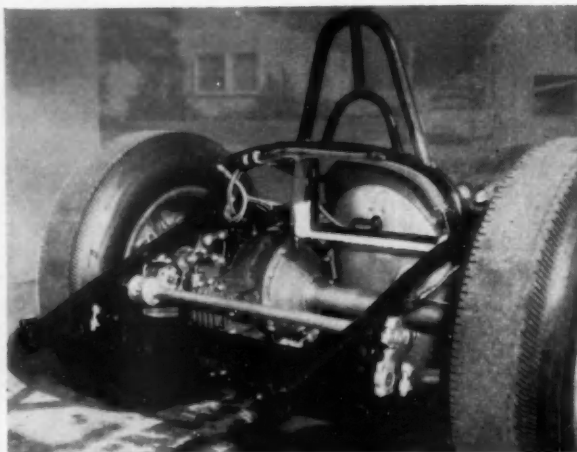
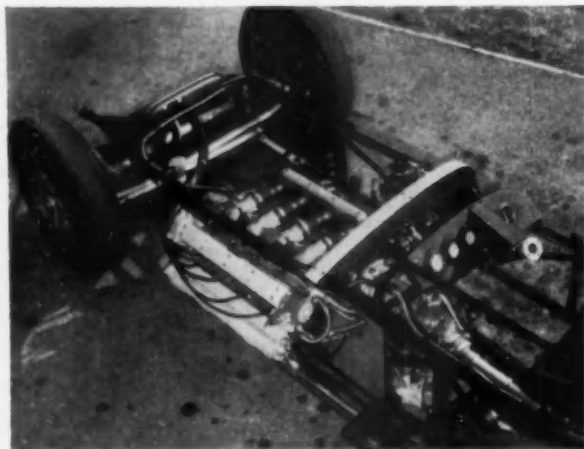
Frank Kurtis believes that much of the equipment coming to the track has lost its glamour. And that there's an "engine gap."

He's convinced that a smaller engine would be a real forward stride. "We can see the trend in today's compacts. I'm delighted that the major automakers see it that way."

A smaller and lighter engine would offer a real challenge to race car designers, Mr. Kurtis says. They're continuously striving to build in greater strength without adding weight. If the engine weighed less, they would build smaller cars, use lighter-weight materials, and add extra safety features.

Al talked with A. J. Watson, builder of many Indianapolis winners. Here's how he sees the trend:

"I predict that future Indy cars will have their engines in the rear. They've proved out on Grand-Prix circuits. And they handle as well, if not better, than front-mounted engines. If we put them in the rear, new chassis designs are sure to come. These cars will be independently sprung. And by going independent, we can save about 100 lb in the running gear."



JIM ROBBINS SPECIAL

Jim Robbins Special built by Eddie Kuzma. Horizontally-placed Meyer & Drake engine is far to the left.

Rear view of Jim Robbins Special, showing torsion bar arrangement and mounting rails for fuel tank.

A modified engine crankcase accommodates a dry sump lubrication system.

Actually, three complete engines will go to the track. They vary slightly in valve timing. The kit will have four sets of cast iron heads and four sets of aluminum heads.

Year by year, Meyer & Drake keep improving their engines. Two of the new ones are counter-clock rotation. The owners hope that the reverse torque reaction will improve car handling characteristics. Reverse rotation called for a special oil and water pump drive.

AUTOMOTIVE INDUSTRIES interviewed Leo Goossen, design engineer at M&D. "Our engine's rpm during racing has been going up each year. It now reaches a peak of about 6700 to 6800 rpm for short periods. So we had to improve our camshaft oiling system.

"We used to take off a lead from the main scavenging line on the oil return to the tank. Under certain conditions, this resulted in foamy and inadequate oil reaching the camshafts. In some cases, the valve tappets didn't get enough lubrication.

"Our new design takes the oil directly off the high pressure line. This insures solid oil at the tappets and camshaft bearings. We get pressure control by the regulator valve in conjunction with a restricted jet," Mr. Goossen says.

Some cars will have power steer-

ing. To drive the hydraulic pump, M&D designed and built a new crankcase front end cover. It will mount the pump along with an extension shaft off a timing gear for the drive.

Those owners who aren't installing power steering will use this same new cover to mount their fuel pump.

Since the engine's inception, dural buttons have retained the connecting rod pins. To lighten the piston pins somewhat, and in certain cases to cut down on button wear, Spirolox snap rings may replace the buttons. A number of engines with M&D pistons will have this type retainer.

Valve timing and the 0.440 in. valve lift will be the same as last year. Compression ratios still range

14.5:1 and 15:1, using methanol fuel.

When racing enthusiasts get together, talk usually leads to the Meyer & Drake engine. We thought you'd like to have these brief specs: 255 cu in. with bore 4.281, stroke 4.375, piston displacement 251 cu in. Horsepower 400 at 6500 rpm. Four valves per cylinder. Two overhead camshafts driven by a train of spur gears. Cast-iron cylinder with integrally-cast, head-barrel-type crankcase with five main bearings bolted to webs in the case.

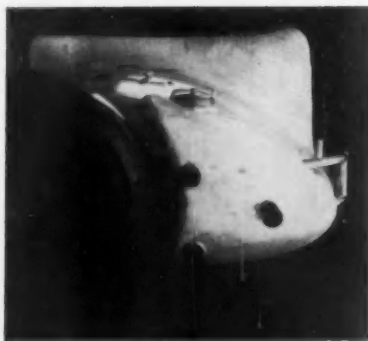
Other M&D engine features: duplex oil pump, both scavenging and pressure; magneto ignition; and fuel injection.

Young builder A. J. Watson, Glendale, Calif., has two new cars ready for this year's go. Both are Leader Card Specials. Watson will do the chief mechanic chores on the car driven by Rodger Ward. Chief mechanic on the Johnny Boyd car is Chic Hirashima.

The new Watson cars are identical in construction and features. Both have coil springs and Monroe shock absorbers on all four wheels. Power steering on both cars is by Saginaw Steering Gear Div. of General Motors.

"Old Reliable" M&D engines power these cars. The engine has a pre-heat water system and a 14.5:1 compression ratio. Watson mounted the engines vertically, but eight

(Turn to page 78, please)



TWO-TIME WINNER

Special eight-gallon oil tank on car owned by Leonard Roy of Denver. This is the car built by George Salih that won in 1957 and 1958.

APPPLICATION of the philosophy of automation to a variety of manufacturing processes in the automotive industries has resulted in a tremendous impact upon engineering economy. Not since the beginnings of the industrial revolution have we observed a principle that has created so great a stir among the public, labor circles, politicians and the social philosophers.

The subject has too many ramifications for an overall appraisal in a single presentation. So this discussion will be confined to the transfer machine which has had such wide exploitation in the mass production industries. The only comment I shall make on

machine was hardly used before the war started and it was only in the postwar era that other applications began to enter the picture. Among the earliest of these was a 1000-ft line at Buick for machining the straight eight cylinder block for the Super model. Others came in such quick succession that few of us could grasp the perspective.

Effects of Evolution

The picture of events to-date shows the remarkable effects of evolution. In the beginning — around 1946—the transfer machine was viewed with considerable skep-

the roller conveyor section between the units served as a quality control station where an operator could inspect the part visually, at least, before he pushed it into the next section. This made it feasible to build fair sized banks of parts at each station so as to keep the line running even if an earlier station was down.

JIC Standards

Before long there was a meeting of minds on JIC standards for electrical and hydraulic systems. This, coupled, with some excellent operating experience established the transfer machine as a reliable as well as the most economical method of producing parts in large numbers. At this point many of the transfer machines of earlier vintage were treated to automation links between individual sections, thus converting them to a completely automatic cycle. Typical of this was the DeSoto V-8 cylinder block line of that day.

Little by little transfer machines were applied not only to cylinder blocks and heads but to automatic transmission cases and extensions, and even smaller components. And this led eventually to the fully automated lines for producing such complex parts as transmission planet gears and ball bearing races. These were complex not only because of the variety of process but also because of the range of fine tolerances involved.

Automatic Controls

More recently we have seen the introduction of the Tool Board; automatic gaging devices with feedback control; automatic probing stations; and drill detectors. Today the transfer machine emerges as a reliable piece of equipment requiring very little maintenance, capable of great flexibility, self-checking with a high degree of quality control.

Transfer machines involve an enormous capital outlay. At the start and today the high cost of an installation brings up questions of the effect of the machine on product changes and improvements. Will it stifle engineering progress by freezing a single design. (cont'd)

The Transfer Machine *and its Applications in the* Automotive Industry

By Joseph Geschelin

DETROIT EDITOR

the general problem is this: it seems peculiar to me that the politicians and social philosophers have not grasped the point that without the applications of automation and without the aid of transfer machines the automotive industries could not conceivably pay out the labor rates that exist in the industry today with a price tag on cars and trucks within the reach of the buyer's purse.

Let us now turn our attention to the transfer machine. I need not define it to our readers. Suffice it to say that the modern transfer machine can be designed in any reasonable size and with sufficient heads to completely finish a complicated part such as a cylinder block or cylinder head, a transmission case, or any other part that involves a multiplicity of operations.

Although Nash in Kenosha installed the first example of a transfer machine around 1941, the

ticism. And rightly so. By comparison with previous experience it represented an enormous investment. Moreover, the design was characterized by an intricate maze of electric wiring, the complication of electronic control devices, hundreds of relays and limit switches, and the addition of hydraulic systems with their plumbing and accessories. There were questions as to the reliability of the equipment as well as the serious problems of maintenance in the event of a break-down.

For these reasons the initial installations were confined to large parts made in large numbers. Moreover, all early installations were comprised of individual sections, sometimes machines of different makes, with a physical separation between them. In theory,

Advance Planning

A serious problem indeed, it was solved by advance planning. Today a new installation implies advance product studies reaching at least five years into the future. The objective is to design a machine that will accommodate the future part without too much outlay. It has resulted in equipment provided with many idle stations reserved for future use.

The transfer machine was conceived as strictly a single purpose machine justified only on the basis of large numbers. How does it appear today?

Versatile Equipment

The fact of the matter is that for the 1961 models, particularly for components of the compacts, the users have been able to rebuild equipment intended for other purposes and to produce unified transfer machines for an entirely different part. Advance planning coupled with the inherent flexibility of well designed transfer machines has produced some surprising results. We have two current examples. One is the transfer line at Pontiac for producing V-8 cylinder blocks which was converted to the handling of the four-cylinder Tempest block; and the 304-cu in. V-8 cylinder block line at the IHC Works in Indianapolis which was arranged to handle the 152-cu in. four cylinder engine for the new Scout vehicle. In each instance both blocks are put through the same V-8 machine in batches.

Perhaps an unexpected development is the realization that the transfer machine, in a special case, becomes a precision machine in every sense and, in fact, the only way to produce a certain part. A case in point is the installation at Saginaw Steering Gear for producing the 1961 power steering gear case on a pallet type machine.

Special Machine Tool Standards

This leads us to a consideration of the next generation of transfer machine design. We refer to the forward step taken by Buhr in

producing in June, 1960 the first transfer machine built to the Special Machine Tool Standards developed by the automotive committee which formulated the original JIC standards. We shall refer to this as "SMTS" hereafter.

What does SMTS mean? For some time transfer machines have been described as being of module or building block construction. Practically, this meant that a transfer machine could be designed by an individual manufacturer by employing his own standard heads to integrate stations and, finally, the entire machine. SMTS, on the other hand, defines all transfer machines conforming to the standard as being composed of individual heads that have exactly the same mounting dimensions on the machine bed. Thus a machine of SMTS type will permit a free interchange of heads from one location to another. Moreover, in the event of a product change it will be possible to remove one or more heads and replace them with other heads, even if an entirely different operation is required or if a horizontal head is to be replaced by a vertical head or an angular head.

Wider Use of Aluminum

The widening use of aluminum has brought with it another phase in transfer machine development. As will be shown later, it is necessary to provide for extremely high cutting speeds and feeds, as well as provisions for supplying cutting fluids at exceptionally high pressures and heavy flows. The initial examples, mentioned here, are compromises. From now on we should see entirely new types of equipment aimed specifically at aluminum machining at maximum efficiency.

More recently the flexibility of transfer machines has been dramatically demonstrated by the installations at Detroit Diesel and GMC Truck and Coach Division for machining cylinder blocks and heads and other components of heavy duty Diesel engines and gasoline truck engines, respectively. In these two instances volume is

comparatively low for any given part and the equipment is required to accept a variety of parts scheduled in batches. To achieve economic results, it has been necessary first to design entire lines of engines, regardless of size and number of cylinders, as integrated families with a high degree of interchangeability of parts as well as hole patterns.

Provisions for Rapid Changeover

Given a family of engines with a high degree of similarity as to hole spacing, the machine tool builders came up successfully with transfer machines capable of rapid changeover from one part to another. This has been accomplished in various ways—by designing interchangeable fixtures; by the addition of idle stations which could be activated by a setting on the electronic control console; by an arrangement for changing the cycling of a station or an individual head simply by pressing a control button; and in other ways unique to a given machine tool builder.

At Detroit Diesel the machine line handles cylinder blocks for V-6, V-8, and V-12 Diesel engines. The shift from one block to another is effected quite rapidly through the system of controls in each transfer machine.

GMC has a family of three V-6's with different bores but machined from the same basic casting; and one V-12. By careful planning of part design a majority of operations are identical; where variations in dimensions occur the machines have been designed to accommodate for the differences. Out of some 580 operations on the V-6 line, over 540 apply equally as well for the V-12. Both blocks are processed over the same line except for a few special operations.

Holding Close Tolerances

One of the most noteworthy of recent installations in a parts plant is the 96-station Greenlee transfer machine, of pallet type, at Saginaw Steering Gear Div. The machine is arranged in the form of a rectangle with a developed length of 508 ft. This equipment

machines the power steering gear housing which requires maintenance of extremely fine tolerances. Besides the close tolerances on dimensions there is a requirement of concentricity of bores as well as flatness and squareness of flanges and plane surfaces. Interesting too is the fact that the initial machining stages remove as much as 3-3/4-lb of metal from each piece.

Before this equipment was installed Saginaw attempted preliminary production, employing standard machines with good operators. They found that conventional methods, even tool room methods, would not satisfy design requirements.

V-8's or Fours on Same Machines

The soundness and versatility of a modern transfer machine is well exemplified in the situations faced by Pontiac in launching the Tempest and by Harvester in introducing the tiny Scout model. In both instances it was possible to adapt transfer machines designed specifically for producing V-8 engines to the machining of a block that represents just one bank of the V-8 to produce a four cylinder engine.

The Pontiac V-8 cylinder block machine line, which has been in use for a number of years, consists of a roughing section and finishing section, the latter being associated with the operations following assembly of main bearings caps. The roughing section consists of two duplicate lines of Ingersoll and Greenlee transfer machines. Here they have set aside one line exclusively for the V-8 block, while the other line handles both blocks, scheduled in batches.

One detail was required to make this possible—the addition of a V-locator on the single-bank block casting for proper locating on the transfer mechanism in the Ingersoll machines. When the single-bank block is scheduled, the foreman operates a single key switch which cuts out one bank of boring tools on the cylinder boring heads. Obviously, when the line returns to V-8 machining the left bank

boring heads are cut in to cycle.

Beyond this point on the Ingersoll line, it was necessary to add one station to take care of a special milling operation on the 4-cylinder block. In the case of drilling and tapping heads some stations require more or less tools for the 4-cylinder block, necessitating a change-over for each type of block.

Greenlee transfer machines were treated in exactly the same manner, namely leaving one line exclusively for the V8, adjusting the other line to take both blocks.

However, when it came to panrail drilling on the Greenlee, it became necessary to make some special arrangements to support and balance the 4-cylinder block due to the elimination of one bank. This was solved by Greenlee by the addition of special stripper plates and clamps on the LH bank side to hold the block securely. On the Greenlee line, too, it was necessary to add several new heads to take care of engineering changes on both blocks.

Cylinder bank drilling on the Greenlee is taken care of by the introduction of a key-operated cut-out switch which idles the heads for the LH bank. At the end of the Greenlee line a new head was added to take care of the 4-cylinder block. This was easy to do since the machine had ample provision for additional heads.

On the finishing section of the line where Ingersoll equipment is employed for cylinder boring, cam-and-crank boring and associated operations, one section was rewired to make possible complete intermixing of blocks or running them in batches. Honing operations were treated in the same way—complete mix or either 4-cylinder or V-8. In each instance, Pontiac has installed limit switches within the station and just outside the station to cut out one bank of boring tools or hones when the message is sent through by a single-bank block.

Toward the end of the Ingersoll transfer line there is a station at which milling is done on both sides of the block. At this point Pontiac has installed an additional

head with a heavy saw to cut off a heavy lug on the LH side of the 4-cylinder block.

It is obvious from the foregoing that cooperative action among engineering manufacturing, and the machine tool builders, coupled with advance planning made it possible to convert the block line with the minimum of effort and cost. Moreover, wherever changeover has to be made, this is done in the most economical fashion. In fact we were told that the total time for a changeover from one block to another on the single line requires but 45 minutes.

Large Scale Aluminum Machining

Let us now turn our attention to several examples of large scale aluminum parts machining to point up what should be next development in transfer machine design.

First examples is the aluminum cylinder head for the Olds F-85 V-8 engine. The main problem at the start was the selection of tools and tool forms, and speeds and feeds best suited to the specific aluminum alloy. Any change in material specifications may well require a major change in these variable. The next problem is associated with the nature of chip formation. The mass of aluminum chips, produced at high cutting speeds, tends to collect around the tools and fixture surfaces and ways. To relieve this situation it is necessary to provide massive cutting fluid flooding under sufficient pressure to remove the chips. The major function of the cutting fluid here appears to be for chip removal rather than tool cooling. In fact, Oldsmobile estimates that about 80 per cent of the effectiveness of the cutting fluid is for this purpose.

Now for some figures on cutting speeds and feeds. All of the outside surfaces and pads are milled in a 7-station Snyder transfer machine. The cover face, exhaust bosses, and bolt bosses are milled at the rate of 2075-sfpm with feed of 159-in. per minute. The joint face is milled at the rate of 2000-sfpm, while the intake face is cut at
(Turn to page 60, please)



New Jaguar XKE model

ONE of the interesting points to note about this year's Geneva Show is the evidence of a general change in strategy concerning new model announcements. In previous years it was the custom of the European automobile industry to hold back its announcements and presentation of new models for its own national automobile shows; German manufacturers in Frankfurt, the French in Paris, etc.

This does not seem to be the case any more. Manufacturers not only displayed their latest models but tried to beat each other to the punch in press announcements.

More or less simultaneously with the Geneva Show, the European press brought out pictures and data of the new Volkswagen 1500 (Germany). Its price in Germany is around \$1500. The Karmann-Ghia version of the new Volkswagen 1500; and the new version of the 2 C.V. Citroen (France) four to five passenger, four-door sedan; a new Fiat (Italy); and a 1500 four-door sedan also were announced.

The 1500-1700 cc class will be the most competitive with Opel, Ford, Borgward, VW, Fiat and, it is rumored, BMW.

The mini cars are decreasing. In a prosperous economy the buyer wants more comfort.

So it is understandable that the Geneva Show was somewhat of an anticlimax compared to these startling releases.

No doubt the most exciting car

The Geneva 1961 Salon

By Albrecht Graf Goertz
Goertz Industrial Design
New York and Munich, Germany

in Geneva was the new Jaguar XKE which comes as a two-passenger coupe and convertible and

also has a hard-top for the convertible. These cars stole the show. They are very neat in concept and the price is below \$6000. My only criticism is that the car falls a little short in respect to passenger comfort for every-day use. It is just a little bit too close to a racing car.

Mercedes showed for the first time the 220 S.E. coupe which I am sure will sell well, but style-wise it is a little disappointing, being too close in appearance to the 220 sedan. Most of the sheet metal is new, and price-wise there is quite a difference.

Facel-Vega brought a new hard-top version on the four-passenger Facellia.

Henri Chapron, who last year showed a convertible on the Citroen D.S. 19, brought a hard-top for this car, "Le Dandy."

Geneva usually had a display of a lot of exciting specials by Italian



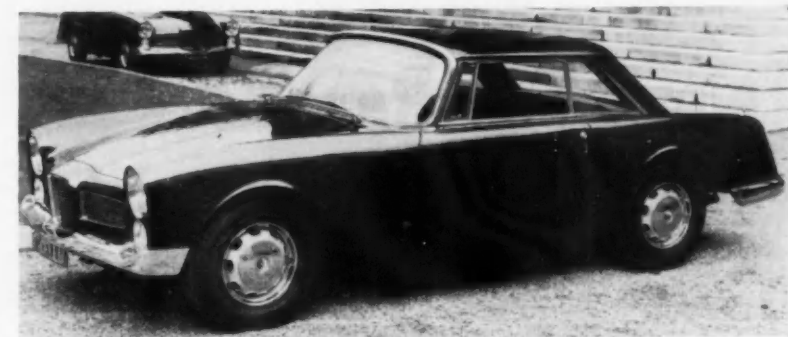
Citroen D.S. 19 with hardtop body by Henri Chapron

body builders. This year even that was a little disappointing. Through the liaison of Farina with General Motors and Ghia with Chrysler, the Italian body builders have become a little too much influenced by U. S. styling trends, probably because they are trying too hard to please this market. An example of this trend is Frua's styling on a Maserati. He also showed a two- and four-door sedan on a Studebaker chassis. Rumor has it that Farina is to build a two-three passenger coupe on a shortened Corvair wheel-base, fifty a day; one hundred a week?

Among the Italians there seems to be no new trend and, if one were to put last year's specials alongside this year's, I think the former would look better by comparison. The exceptions seem to be Bertone and Abarth. Bertone's treatment of the Alfa 2000 Sprint four passenger coupe is very neat and a good continuation of the very popular 1300 Julietta coupe. Abarth's version of the Fiat 2100 is an extremely straightforward, clean, yet exciting design.

Lancia's Flavia is worth noting, although the appearance is somewhat too close to American compacts. The Innocenti, which is the Italian version of the Austin-Healy Sprite on a Sprite chassis, is an interesting comparison.

The most trend-setting and copied car seems to be the 1960 Corvair, which appears to have in-



Hardtop version of the Facellia brought out by Facel-Vega



Alfa Romeo 2000 Sprint

spired several designs.

To sum up Geneva, I think this is a very interesting time as far as the entire automobile industry is concerned.

There are too many models around and the reason is uncertainty in the industry as to what the public wants. Experimentation should be continued and even in-

creased, but decisions should be made by management and not by the public.

The liaison with Italian body-builders, I feel, is very fruitful as they not only present sketches or scale models, but prototypes, and this for a negligible amount of money. This trend should be increased. ■



Innocenti, Italian version of Austin-Healy Sprite



Abarth body on a Fiat 2100

Leipzig Fair Reveals Latest Communist Models

By David Scott

BRITISH CORRESPONDENT

THIS year's Leipzig Fair in mid-March gave further evidence that the East German auto industry is striving to improve



Trabant panel truck has a quarter-ton load rating. A 20-hp engine drives the front wheels.



Rear-engined Zaporozhets is sprung by coils at the rear and laminated torsion bars in front.

and increase the body variations of models within the existing ranges of vehicles, which has been narrowed down to two basic cars and three types of trucks (1, 2½ and 4 tons) in an effort to standardize production.

One new truck on show was the Robur 2500, which replaces the outdated 2½-ton Granit. Made in Zittau, at the former Phänomen factory, the forward-control model on a 9-ft 11-in. wheelbase is powered by optional Diesel or gasoline engines, both air-cooled and developing 70 hp. The gearbox has five forward speeds, and four-wheel drive is available.

The chassis is also used for an 18-passenger bus with spacious luggage compartments underfloor and in the rear. This model will be on sale in June, and planned annual production is 6500 trucks and buses.

The Sachsenring plant in Zwickau presented a panel truck version of its baby Trabant car, which has a 20-hp, aircooled engine in unit with the transmission and front-drive assembly. It has a quarter-ton load rating, with the cargo area accessible through the full-width rear door. Output of the Trabant is expected to reach 39,000 this year, rising to 65,000 in 1965.

Among the other Communist countries, Russia featured the small rear-engined Zaporozhets, which is now being assembled in Belgium for sale in the West. The 45-cu in. V-4 engine, developing 23 hp at 4000 rpm, is air-cooled by a cast alloy exhaust fan.

Air enters the tail compartment through side louvers, and is drawn past the partially-cowled cylinders by the blower that exhausts directly through a vent in the lid. This flow pattern prevents entry of dust into the compartment caused by the low-pressure area behind a moving car.

Compactness of the engine is increased by incorporating the generator in the fan hub, with belt drive through a single common pulley. Transmission, final drive and swing axle assembly are in unit with the engine. All-independent suspension is by coil springs at the rear, and transverse laminated torsion bars in front. A combustion-type heater, burning gasoline, is built into the engine compartment as standard equipment.

Hungary displayed the new Csepel D-705 tractor designed to haul a semi-trailer with a 12½-ton payload rating. Engine is a 505-cu in. indirect-injection six-cylinder Diesel developing 145 hp at 2300 rpm. The large forward-control cab has individual seats flanking the engine, and a bench seat for four people behind.

Two examples of the tractor-trailer combination were shown, one with a 3300-gallon insulated milk tanker, and the other a gasoline tanker with twin cylindrical containers having a combined capacity of 3700 gallons.

Another Hungarian exhibit was the Dutra D4K heavy-duty industrial and farm tractor with all four wheels driven by a 329-cu in. four-cylinder Diesel with a maximum output of 85 hp at 2200 rpm.

Front wheels are driven from a transfer case on the side of the main transmission, via a splined shaft to the offset forward differential. Steering is not power-assisted. The 13 x 30 tires are British Dunlops. There is three-point hydraulic linkage and a pto at the rear.

One new development from Poland was the Ursus C-325 farm tractor, replacing the heavy machine derived from the Lanz Bulldog which had previously been produced there under German war reparations. Of Polish design, it has a two-cylinder direct-injection Diesel of 110-cu in. displacement developing 25 hp at 2000 rpm. Transmission has six forward and two reverse speeds.

A significant absentee at Leipzig this time was the East German aircraft industry, following much-publicized displays at the last two Fairs which included mock-ups of the BB-152 medium-range jet transport and examples of the Pirna gas turbine powering it. Since even West Germany with considerably greater economic strength had not yet attempted such a project, the eastern one suggested a purely prestige undertaking, but indignant officials insisted that it was a genuine commercial venture.

A year ago the East Germany Foreign Trade Minister announced that the plane would be available for export by the end of 1961 at a price competitive with the French Caravelle. But this year there was

no sign or mention of the aircraft at Leipzig, and the industry appeared to be under a cloud.

It now emerges that all aircraft production has been shelved as a misconceived drain on the country's meager resources of skilled manpower and critical materials. The industry at Dresden with its 27,000 employees will switch to other work.

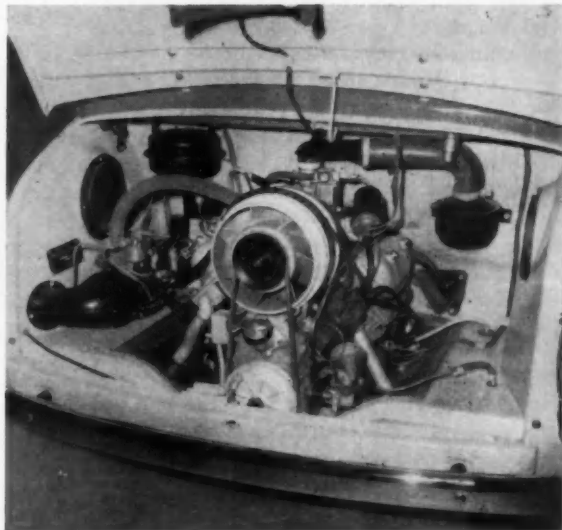
On the western side, vehicle exhibitors included Rootes, Renault, Simca, Fiat, Daimler-Benz, M.A.N., Deutz and Büssing. Steel displays were on a record scale, and the participation of 50 British producers, together with most of the leading West German, French, Swedish and Austrian ones, turned this sector

of the fair into the biggest metallurgical show ever.

American steel companies took part for the first time, with Sutton Steel & Metal Corp. of New York representing National Steel, Babcock & Wilcox, and Washington Steel.

Sheet for car bodies was reported to be in biggest demand, and "Wartburg & Chrysler" was the eye-catching legend on the Sutton stand over a display of pressings from American steel for that East German model. During 1960 the company had, in fact, supplied 20,000 tons of sheet to the East German auto factory at Eisenach, and with prospects of further orders. ■

Zaporozhets V-4 engine features a cast alloy extractor fan with the generator built into the hub. Combustion heater is at the left in the compartment.



Heavy-duty Hungarian tractor has the four wheels driven by a 329-cu in. 85 hp Diesel.

Machine Tool Builders Report Upward Trend—But a Small One

By
Charles A.
Weinert

EASTERN EDITOR

AT the close of the 1st Quarter, machine tool builders essentially reported little change from the industry's business situation as of January 1 (see AI of February 1, page 49).

Nevertheless, order backlogs were slightly higher at April 1, as was also the activity on inquiries. And the outlook for new business in the 2nd Quarter similarly showed a small rise. In all respects, the situation displayed optimistic "ups"—rather than "downs"—even though relatively minor.

Despite the more or less "status quo" nature of the business picture, price increases on machine tools will still bear watching. Labor and material costs continue to creep up, and the reports reflect needed reimbursements in the form of additional price rises.

Again, as in our prior reports, we must emphasize that these impressions are gained from averaging-out all the responses to our latest periodic survey questionnaire. They do not necessarily apply to any one builder. The circumstances often vary considerably from company to company.

The details being presented in the following are based on 40 reports to AUTOMOTIVE INDUSTRIES, cooperatively supplied by leading machine tool executives. (For back reference, the results of similar calendar - quarter surveys of the machine tool industry were published in AI issues of January 1, April 1, July 1, and November 1, 1960, as well as in the issue of February 1, 1961.)

ORDER BACKLOGS

With respect to unfilled orders on hand April 1 versus January 1, 1961:

Order backlogs of "about the same" proportions were reported

Latest AI SURVEY Shows—

- Slight Gains in Order Backlogs
- A Little More Inquiry Activity
- Optimism for 2nd Quarter Orders
- More Increases in Machine Prices

by 18 (of the 40) companies. One of these respondents indicated, however, that his company's orders for the 1st Quarter '61 were up 30 per cent above those booked in the 1st Quarter '60.

Higher backlogs, ranging from 4 to 52 per cent, were reported by 13 companies. The average for this group is +21 per cent.

Lower backlogs, ranging from 5 to 50 per cent, applied to 9 of the companies—with a group average of -23 per cent. One of these companies (39 per cent down) reported that March shipments amounted to 33 per cent of its January 1 backlog, and 54 per cent of its April 1 backlog. Another (50 per cent down) reported heavy February shipments.

Overall, for the 40 companies the average is +1.8 per cent more orders in hand as of April 1, compared to January 1, 1961.

AUTOMOTIVE ORDERS

In the questionnaire, the builders were asked, "How much of your total orders on hand as of April 1 is represented by orders from automotive companies?"

As before, the vast majority (34 companies) reported automotive orders on the books — some with very high percentages.

Automotive order portions of total business in process ranged from as little as one to as high

as 99 per cent. The higher figures included, in individual cases, three 60, one 65, four 70, one 75, one 86, one 90, and one 99 per cents. At the other end of the scale, one builder with 2 per cent of automotive orders said, "Our products are not in great demand by automotive at any time."

The group average for the 34 companies is 37 per cent in automotive orders.

Five companies, among the total of 39 giving definite indications, stated they had no automotive orders on the books as of April 1.

INQUIRY ACTIVITY

The relationship of inquiry activity at April 1 to that which applied at January 1, 1961 also was requested.

Inquiry activity at the "same" level was listed by 14 companies.

More activity, with a range from 5 to 33 per cent, was reported by 19 companies. The average for the group of 16 giving numerical percentages is +17 per cent. One of the other three merely stated, "Trend appears to be upward, with improving potential for early orders."

Less activity, ranging from 5 to as much as 50 per cent, was shown by 7 companies — with a group average of -21 per cent.

For all of the 37 companies which gave numerical percentages

on inquiry activity, April 1 compared to January 1, the average is +3.2 per cent.

BUSINESS OUTLOOK

Inquiry as to the outlook for business in the 2nd Quarter compared to the 1st Quarter '61 brought the following response:

The "same" volume was predicted by 18 companies.

An increase in incoming orders, ranging from 5 to 50 per cent, was forecasted by 13 officials. Two of these predicted 50 per cent rises—one of whom had an unchanged order backlog, and the other a 20 per cent higher order backlog, April 1 versus January 1.

The group average for the 13 who predicted increased business is +20 per cent. Three additional respondents indicated improved business prospects, but gave no figures.

A downward swing on new orders in the 2nd Quarter was opinioned by 5 executives. The percentages ranged from -4 to as much as -40. For this group the average is -22 per cent.

Overall, for the total of 36 companies with numerical designations, the average forecast is for a rise of 4.2 per cent in 2nd Quarter orders over 1st Quarter '61 orders.

AUTOMOTIVE PROSPECTS

Query as to whether any sizable automotive business was in prospect resulted in this response:

Some (13) said "yes," 3 were uncertain, and 24 said "no."

Builders' comments on this question included the following:

"Quite a bit—Chevrolet, Ford, Volkswagen."

"About the same."

"Approximately \$100,000."

"Don't know."

"Yes, due to new designs of engines for domestic market."

"Some small increase."

"We do not contemplate any programs as such; but foreign automotive, as purchased in the United States, could make the difference."

"Particular interest in machines related to die manufacture—new techniques now available through application of tape control."

"Present activity to remain all year."

"Have outstanding quotes for what we consider sizable amounts, but don't know yet if they will result in orders."

"Anticipate bidding on two automotive engine programs and two suspension programs in near future."

EQUIPMENT DELIVERIES

Those addressed were asked, "Do you anticipate the delivery time on orders placed during the 3rd Quarter '61 will run longer than that quoted during the 1st Quarter '61?"

The same delivery rate was foreseen by a majority of the companies—27 to be exact. (One of these, nevertheless, mentioned a delivery of 11 months.)

On the other hand, longer equipment deliveries—ranging from 2 weeks to 12 weeks, and mostly on the order of a month—were expected to apply to the machines of 11 companies.

Two companies thought their deliveries would be shorter on orders placed during the 3rd Quarter—one to the extent of 4 weeks.

Builders' comments:

"Increasing business will be on longer-lead-time machines, numerically-controlled." (6 weeks longer)

"Will depend on machine type. Some have lengthened materially in last 60 days."

PRICES OF MACHINES

As a means of further developing the price situation on machine tools, the questionnaire inquired, "Do you expect to increase, in the near future, the prices of your machine tools; and if so, what is the percentage increase and when will it become effective?"

In this connection, our survey report of February 1 might be referred to for the starting point of price-change developments this year (actually, there were some last year). The February 1 report revealed that 12 price increases had either been placed into effect, or were in contemplation, as of January 1.

The present survey shows that

two of the previously-contemplated price increases (among the 12) have since been firmed. Also that six additional price increases were either imminent or in prospect as of April 1.

One of these eight is a 10 per cent rise on one line of a maker's machines, effective early in April. Two others call respectively for price increases of 5 per cent, effective May 1; and 10 per cent, effective during the month of May. Another is a 10 per cent increase, effective mid-May on part of the company's line—an increase of about 6 per cent having already been placed into effect on certain models during March.

In addition, one builder lists a 5 per cent increase without naming the effective date; and another builder a 10 per cent price increase effective June 1. Two others report increases of 6 to 7 per cent, effective during the 2nd Quarter, and 5 to 10 per cent, effective over the next six months.

Altogether, during the past seven months a total of 28 different companies have advised us of price rises in effect or under way. (There are undoubtedly more.)

Beyond the companies who have reported decisions to boost prices, three have just hinted "they may be necessary."

Among the 40 responses to our latest questionnaire, 29 showed "no change." One respondent, however, qualified his answer with the comment that price adjustments had recently been made effective.

RECOMMENDATIONS

The final question was, "Do you have any personal recommendations to make at this time to automotive industry officials which should be taken into account by them when planning for near-future machine tool acquisitions?"

Most of the answers, as heretofore, requested and recommended longer lead times. Other aspects were covered, however.

Builders' comments:

Company Spokesman—"Same as last time—order soon enough."

T. L. Strimple, president, the National Acme Co.—"Savings rep-

resented by application of automated high - production machine tools most effective way of meeting cost-price squeeze."

Company Spokesman—"Longer lead time to properly evaluate your requirements and prepare an intelligent proposal."

C. R. Hibbard, sales manager, The Fosdick Machine Tool Co.—"Should investigate applications for numerical control in toolrooms, model shops, and on short-run repair parts."

Company Spokesman—"We feel that continuous repairing and reconditioning of old machine tools, as well as 'tooling-up' of used and semi-new machines for the purpose of shipping into foreign countries, should definitely be minimized, since up-to-date equipment and the latest in machine tools are now being produced in this country and should be given an opportunity to perform to prove our capability and strides, versus foreign machine tool builders — especially German, Swiss, Italian, and Japanese."

Company Spokesman—"First Quarter next year should be ordered soon."

George K. Cassady, general sales manager, Giddings & Lewis Machine Tool Co.—"Lead time will be extending as order board reflects increased percentage of sophisticated machine tools and controls."

Joseph P. Crosby, vice-president i/c sales, The Lapointe Machine Tool Co.—"Delivery situation will become tighter as the year progresses."

Company Spokesman—"Suggest they place orders as far in advance of their production date as possible. This would give a chance to get new equipment into good operating condition and ready to produce parts without having automotive people breathing fire down machine tool builders' necks while they work under pressure during setup and trial runs of machines in customer's plant. Presumably this is an unattainable ideal, but in our opinion it is worth making a try for it. Automotive people should understand that the only sure thing about designing, building, and

placing special machinery in operation is that there will be unforeseen difficulties to overcome somewhere in the process."

Donald O. Edwards, manager, Lathe Div., Lodge & Shipley Co.—"Start to up - grade their own toolrooms, die room, and small-lot production (replacement parts) departments with new machine tools."

Company Spokesman—"Final decisions on ordering machine tools presently allow little or no margin in meeting required delivery dates. Any upsurge in demand from present low levels will result in much longer lead times until operations are adjusted to higher production levels." ■

New Brake Rating

The Automobile Manufacturers Association has announced a new method for rating the capacity of truck brakes as an aid to states seeking more precise procedures in registering commercial vehicles.

The method was developed through a series of tests carried out at the Curtiss-Wright Proving Ground in Utica, Mich. The tests were designed to find a reliable method of rating brake horsepower absorption and to establish a requirement on brake horsepower per unit of gross weight.

Results of the tests are contained in a report entitled "Horsepower Rating of Commercial Vehicle Brakes," which has been approved by the Motor Truck Committee of AMA.

Second Best Sun Year

Net income of Sun Oil Co. and subsidiaries increased to \$49.2 million in 1960, a 15 per cent gain over the \$42.8 earned in 1959 and second only to the record \$56.1 million reported in 1956.

The 1960 net was equal to \$3.78 a share compared with \$3.48 a share in the previous year. Revenues rose slightly during the year to \$755.4 million. At the same time, operating costs and expenses declined \$2.8 million to \$564.9 million.

Earthmoving Industry Conference

Total quality control, including control of quality of purchased materials and components, can save money and assure quality in the finished product, Winthrop W. Spencer, manager of Process Control Engineering Services for General Electric Co., told the Earthmoving Industry Conference at Peoria, Ill. The Conference was sponsored by the Central Illinois Section of the S.A.E.

Total control, in which all inspections functions were integrated, Mr. Winthrop said, would start with consultations between the designer and tool engineer during development stages of the product. They would set attainable and permissible standards and tolerances. In the production stage, the manufacturing engineering group and purchasing would see that quality standards were maintained. Finally, the quality control department would cooperate with marketing to see that the product was of a certifiable quality.

Quality control for a new design, he declared, should stabilize quality levels, plan quality audits, and select measuring equipment. It should establish controls over incoming materials and rate new suppliers. Its chief job, he pointed out, would be to establish preventive practices. It can justify itself, he said, because it has been shown that preventive costs are lower than failure costs, which show up in scrap, rework costs and field repairs.

Brig. Gen. James B. Lampert, Director of Army Military Construction, said two new types of engineering vehicles have been proposed for combat engineers. One is a combat emplacement excavator, which should be capable of digging earth at the rate of 400 cu yd per hour. The other is a universal engineer tractor, which should be amphibious, capable of digging, either like a shovel or with a bulldozer blade. It could be either rubber tired or a crawler.

DESIGN FEATURES

of the

BUICK SPECIAL

and the OLDS F-85 ALUMINUM ENGINES

PART II

Cylinder Blocks

Buick—The cylinder block, being the largest individual structural component of the engine, offered the greatest potential weight savings through the use of aluminum (Fig. 1). Semi-permanent mold castings were chosen to permit use of conventional sand cores in forming the water jackets and lower crankcase areas of the cylinder block. All remaining exterior surfaces of the casting are formed by metal die sections.

Long a major deterrent to the widespread use of aluminum cylinder blocks in the automotive industry has been the lack of an economical means of providing a satisfactory cylinder bore surface. This problem was overcome by the adoption of cast-in-place iron sleeves (Fig. 2), thus eliminating the costly manufacturing complications of wet liners with their inherent sealing problems, or pressed-in dry sleeves and accompanying increase in expensive precision manufacturing requirements.

The outside diameter of the centrifugally-cast sleeve is machined with circumferential grooves having a pitch of eight per inch and a depth of 0.010 in. These grooves form a very effective means for mechanically locking the sleeves in place.

The cylinder block design incorporates the dropped pan rail (long a Buick engine feature) having the oil pan mounting surface 2.250 in. below the crankshaft centerline. This configuration provides a continuous, flat oil pan mounting surface and also permits mounting the starter directly in the cylinder block for added rigidity.

The mounting surface for both the automatic and Synchromesh transmissions is provided by the well-ribbed deep-section flywheel housing end of the cylinder block (Fig. 3). The effect of this deep block feature is an increase in the natural frequency of the engine-transmission assembly in vertical bending,

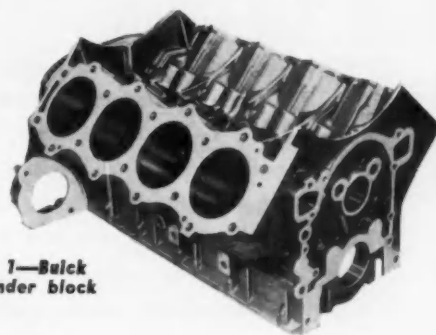


Fig. 1—Buick cylinder block

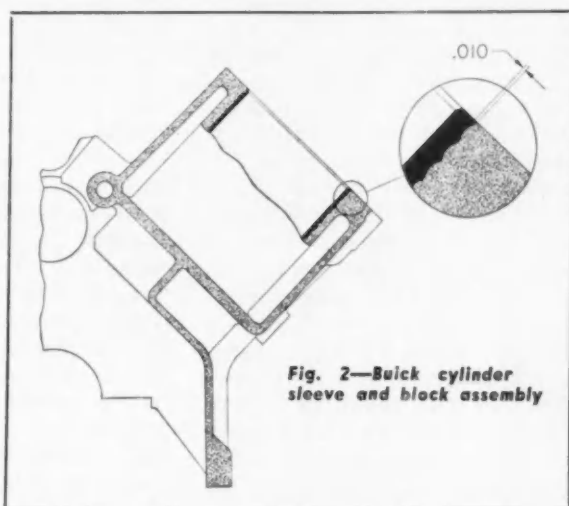


Fig. 2—Buick cylinder sleeve and block assembly



Fig. 3—Buick cylinder block at flywheel housing end

which provides a smoother, more nearly vibration-free installation since this is well above the normal frequency response range of the rest of the vehicle.

Two air inlets are provided in the flywheel housing housing of the cylinder block for the air-cooled Dual

PART I of this two-part article, which appeared in the April 15 issue of AI, was devoted to a general comparison of the Buick Special and the Olds F-85 engines, and described such details as cylinder heads, valve mechanisms, combustion chambers, etc. This second, and final part, covers cylinder blocks, pistons, connecting rods, and crankshafts.

Path transmission. These inlets are covered by the die cast flywheel and clutch housing when the Synchromesh transmission is specified.

Cast iron main bearing caps are used with the aluminum cylinder block and provide effective control of main bearing clearances throughout the operating temperature range. The difference between the coefficient of expansion of aluminum and cast iron resulted in a problem in this area during the early stages of the development program. With the main bearing caps as originally designed (Fig. 4), the higher expansion rate of the aluminum caused the horizontal clearance of the bearing to change at a greater rate than the vertical clearance with a change in temperature. Subsequent redesign of the main bearing caps, increasing the moment of inertia of the cap cross section by 67 per cent, resulted in a significant reduction in the relative change between the vertical and horizontal bearing clearances.

The bolt torque versus clamping load characteristics of aluminum threads presented an additional problem in the control of main bearing clearances. Repeated assembly of untreated bolts in the aluminum threads resulted in a substantial reduction in clamping load for a given bolt torque value (Fig. 5). This loss in load caused a change in main bearing core diameter between machining and engine assembly since the bearing caps are removed and reinstalled. An investigation into the merits of various thread treatments led to the development of a lubricant which gave uniform loading on the initial bolt installation as well as

on reassembly at the same bolt torque. As a result the cylinder head, rocker arm shaft, and main bearing bolts are lubricated prior to the initial assembly since all are subjected to high loads and require uniform performance.

A minimum thread engagement equivalent to twice the bolt diameter was adopted for all bolts threaded into aluminum to permit utilizing the load carrying capacities of the respective bolts. There has been no evidence of loss in bolt loading in combination with the aluminum threads even after extensive operation of all types.

The depth of the water jacket in the cylinder block is only 4.06 in. as compared to an overall bore length of 5.56 in. This results in a reduction in heat rejected to the cooling water and quicker warm-up, while providing ade-

quate cooling capacity. Only one cored opening through the cylinder head deck from the water jacket is provided at the rear of each bank, resulting in a minimum of openings for potential cylinder head gasket water leaks. A cylinder head bolt pattern featuring five bolts per cylinder was adopted due to the excellent performance of this pattern in our larger cast iron V-8 engines.

A 0.015 in. thick aluminum-coated steel, beaded cylinder head gasket is used, and is interchangeable between cylinder banks. Double beads are provided around the cylinder bores for added protection in these critical areas.

Olds—The cylinder block is cast of 356 aluminum. This alloy was chosen because of its high strength, castability and corrosion resistance.

Chemical analysis of 356 aluminum is:

| | |
|-----------|--------------|
| Silicon | 6.5 to 7.5 |
| Copper | 0.20 |
| Iron | 0.50 |
| Zinc | 0.20 |
| Manganese | 0.10 |
| Magnesium | 0.20 to 0.40 |
| Titanium | 0.20 |

The deep skirt block provides for a more rigid connection between the engine and transmission keeping the natural bending frequency of the combined units very high to eliminate vibration periods.

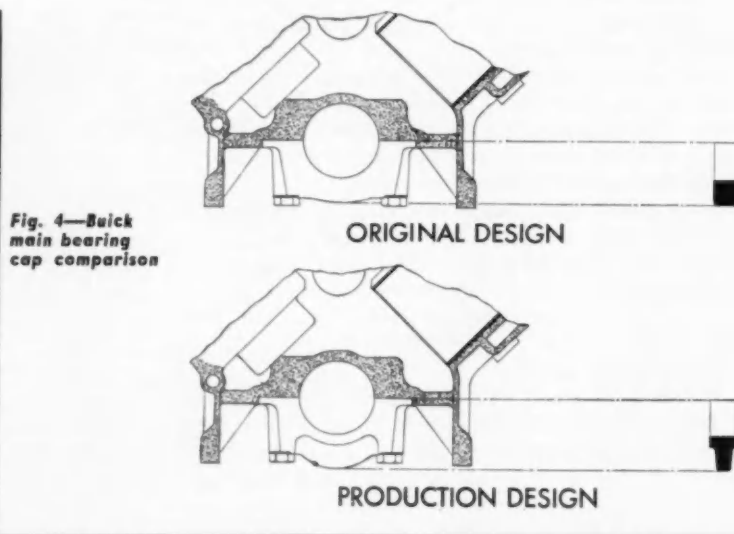


Fig. 4—Buick main bearing cap comparison

Centrifugally cast iron cylinder bore liners are cast in place in the cylinder block. The metallurgical structure of these iron liners result in a harder iron than that present in an all-iron block, which holds bore wear to a minimum.

The "Rockette" cylinder block is cast by the semi-permanent mold process by General Motors Central Foundry Division.

Pistons and Rings

Buick—The piston is a one-piece aluminum alloy casting featuring the long-standing Buick practice of a full skirt, double trans-slot design. Windows are cast beneath the piston pin bosses to effectively divorce the skirt from the bosses in this area. Better dimensional control throughout the operating load range is obtained with this construction since the lower skirt is not as readily affected by pin boss deflections. This piston, coupled with the 0.875 in. diam piston pin pressed into the connecting rod small end, supplies a rugged structural starting point for the transmission of mechanical energy to the flywheel.

Olds—The pistons are all-aluminum alloy and have 0.040 in. pin offset towards the thrust side to prevent cold slap. Pistons are also tin-plated to eliminate scuffing. Two 5/64 in. wide compression and one 3/16 in. wide oil control rings, located above the pin, are used. The top compression ring and both oil ring rails are chrome-plated to guarantee long life and minimum cylinder bore wear without scuffing.

Connecting Rods

Buick—The connecting rods are made of SAE 1141 forged steel and have a center distance of 5.660 in., providing a conservative rod length to stroke ratio of 2.02. Weight control is accurately maintained by the milling of weight bosses located at the connecting rod assembly center of gravity. The connecting rod bearings are of steel-backed babbitt material.

Olds—Connecting rods are forged steel and have "I" beam cross-section for high strength and low

weight. The piston pin is 7/8 in. diam and is pressed in the rod. The rod bearings are steel backed "Durex" and are 2 in. in diameter.

Crankshafts

Buick—The crankshaft is an Armasteel casting having the counterweight periphery and cheeks cast to size, reducing casting weight

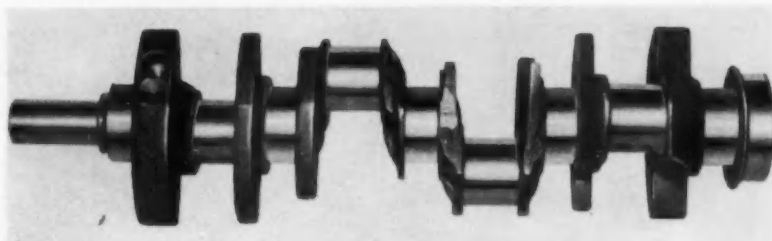


Fig. 6—Buick crankshaft

and machining required (Fig. 6).

The counterweights are contoured for uniform clearance with the piston skirts, thus utilizing the most effective room available for counterweighting. In addition, the counterweights are oriented in the most advantageous plane for balancing the engine with the minimum amount of material. This design approach results in a finished crankshaft weighing only 38.4 lb. The main bearing journal diameters are 2.300 in. and the crank pin diameter 2.000 in., which when coupled with 1.400 in. crank throw, results in an overlap of 0.75 in.

The crankshaft end thrust is taken on a flange bearing at the center main bearing bulkhead. All main bearings are of steel-backed babbitt material, with a groove in the upper insert and plain lower inserts. The elimination of a groove in the lower insert increases load carrying capacity and also reduces oil pump flow requirements by effectively reducing leakage oil at the main bearing and partially metering the oil to the connecting rod bearings.

Olds—The crankshaft for the Oldsmobile "Rockette" is cast from "Armasteel" and is extremely rigid because of the short 2.8 in. stroke. The five large journals run in steel-backed "Durex" main bearings;

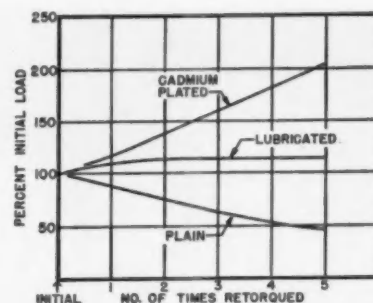


Fig. 5—Bolt loading in aluminum (Buick)

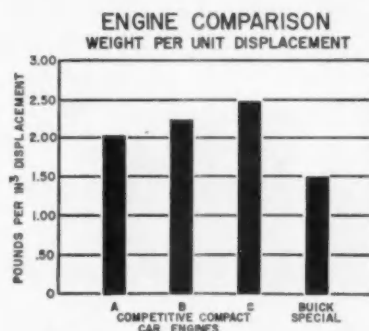


Fig. 7—Comparison of weight per unit displacement (Buick)

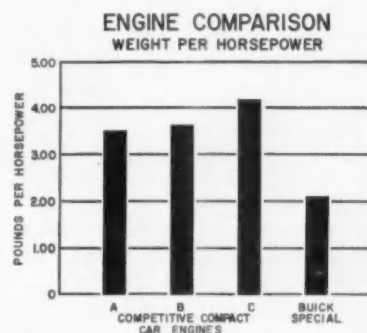


Fig. 8 — Comparison of weight per horsepower output (Buick)

oil is dispersed around the main bearing by grooves in the upper bearing shells like the larger Oldsmobile engines. Crankshaft tor-

(Turn to page 69, please)



Four twin-ram broaching machines start the machining of the connecting rods.

New Connecting Rod Line at Deere's Waterloo Works

This is Part III of a four-part article by Kenneth Rose, devoted to the Waterloo, Iowa, plant of Deere & Co. The final part will appear in an early issue of AUTOMOTIVE INDUSTRIES

USE of high speed precision machine tools of latest design is the basis for turning out connecting rods for the new John Deere engines at Deere's Waterloo, Ia., Tractor Works. Although volume of production will not justify completely automated production lines, elaborate conveyerizing is used to hold materials handling costs on the line to a minimum.

The new production line was set up as a part of the production

By Kenneth Rose
MID-WEST EDITOR

PART III

planning for the new engines announced by Deere early in the fall of 1960. As two sizes of connecting rods are needed, one for the Diesel engines, the other for the gasoline and LP gas models, it was necessary that the line have the flexibil-

ity designed into it to accommodate both sizes. Broaching is used to machine the parts at high speed; boring and honing operations give precision and high finish in the final steps.

The connecting rods come to the Waterloo Works as rough forgings in SAE 1041F steel. In this forging the part later to become the cap is integral with the rod portion. They are first grit blasted to remove all scale. The cleaned pieces are then hardened and tempered to a hardness of Bn 217 to 255, and each piece is Magnaflux inspected. The rods then go to the machining line.

A bank of four Cincinnati twin-ram broaches, of 10 to 15 tons pulling capacity each, is set up at the start of the connecting rod production line. Each machine mounts two sets of broaches, so that each of two passes is a separate operation. The connecting rods are held in fixtures so designed that the change from one size rod to the other involves only the inserting of sizing blocks into the fixtures—the same broaches are used. The rods advance from first to second opera-

tion on each broaching machine, so that two pieces are being machined simultaneously on each. A roller conveyor in front of the bank of broaching machines carries the parts from one machine to the next.

In the first operation on the first machine one side of the crank end of the rod is broached. The rod is then turned end-for-end, and the pin end is broached on the same side under the same broach. In the second step on the same machine the other side is cut to give the piece the required width.

The first operation on the second machine provides the working surfaces for subsequent operations. Three locating pads are broached on each rod in one pass. Two of these are on the piston end, and one on the crank end. In the second operation on the second machine, a portion of the cap screw bosses is faced off, and the first portion of the groove is cut in preparation for splitting the cap from the rod.

The splitting of the cap from the rod is completed on the third broaching machine. In the second pass the key and keyway in rod and cap are rough cut, and the pieces move as a unit to the fourth broaching machine. On one ram the key, keyway, and crank bore on the rod part are finish broached, and the second ram repeats these operations on the cap portion. This completes the broaching operations, and the parts move on another roller conveyor to the next sequence of operations.

Two drilling operations follow. In the first, a 5/16 in. oil hole is rifle drilled through the Diesel rods on a Pratt & Whitney drilling machine. The holes for the two cap screws are then drilled, counter-drilled, reamed, spot faced, and tapped. These are 9/16 in., 18 thread tapped holes. The pieces are then washed to remove oil and chips.

Notches are next milled in the rod and cap on a Cincinnati milling machine. After deburring, the rod and cap are joined with cap screws in a bench operation, using a torque wrench.

The pieces then go to a Buhr boring machine, where the small



While one ram is operating, the fixture before the other ram is being loaded.



After being cleaned in the washer in the background, rods are automatically weighed and sorted.

bore is core drilled, then rough and semifinish bored. On the same machine the large bore is rough bored and chamfered on one side. On the next machine, a Heald boring machine, the large bore is semifinish bored, the small bore is finish bored, and both bores are chamfered. After this sequence the oil hole is drilled on the pin end only of rods for gasoline engines.

A Micromatic hone then hones

the small bore. The oil hole in the pin end is deburred. A bushing is pressed into the pin bore on a Greenard press, and the bushing is precision bored on a Heald boring machine. The large bore is next honed on a Micromatic hone, completing the machining of the piece.

The connecting rods are passed through a Colts washer for cleaning, are blown off, the oil holes are

(Turn to page 60, please)

METALS

Steel Output Continues to Increase, But Prices Are Far from Buoyant. Aluminum Industry Shows Slight Improvement.

By William F. Boericke

Steel Operations Advance Slowly

By mid-April the steel output had inched ahead for the fourth consecutive week. The mills were producing more steel than at any time since last June. Production of raw steel rose to nearly 1,700,000 tons in the second week in April, equal to an estimated operating rate of 58 per cent using the old 1960 index of capacity. But the increase is still at a snail's pace and not all plants are sharing equally in the gains. Yet almost all are convinced that April will show some improvement over March, and expect that May will show further advances. Some mills assert demand from the auto makers is on the rise. The current upturn in auto sales is cheerful news for the steel manufacturers, and the announcement that Detroit will boost the assembly rate in the second quarter gives added encouragement.

Some Price Shading for Specialty Steels

But in spite of the better tone to the market, steel prices are far from buoyant. Contrary to hopes expressed earlier in the year, prices of the more volatile alloy steels have weakened although base prices for carbon steel are holding firm. Some specialty steels have been cut as much as 10 per cent by an important producer, from 30 cents to 27 cents a pound. On the West Coast, the price of certain sizes of electric-weld tubing was cut \$20 a ton and producers of steel conduit complain they are caught in a price squeeze.

Scrap Prices Level Off

Steel scrap prices are levelling off. They rose steadily since last December, and during the first

quarter the composite price advanced about \$9 a ton to about \$36.50, which was still about \$9 less than the post-strike peak in January last year. Iron ore is in heavy over supply with inventories at a high figure, totalling about 60 million tons. On March 1 only 119 of the country's total of 231 blast furnaces were in operation. The start of the shipping season for the Great Lakes iron ore fleet has been delayed more than a month although navigation has been open. The mills are unwilling to increase their inventories of ore further at this time.

Slow Improvement in Aluminum Demand

There's some improvement taking place in the aluminum industry, but as yet the upturn is hardly measurable. Export shipments, which rose sensationally last year, are declining. Sheet and plate shipments, which constitute the largest single portion of mill products, are at barely 50 per cent of capacity. But some of the independent mills are reporting more business although profits are woefully small. Fierce competition is rampant, and purchasing agents have ears only for price.

The big producers are stressing the need for a higher price level. Confronted with another automatic wage increase in August, they dislike the idea of absorbing higher labor costs as they did last year without a compensating price hike for their metal. Said Alcoa's executive vice president, "The industry must develop a more mature pricing policy and regain a firm price structure at adequate levels for fabricated products."

But privately these executives confess they would settle for full capacity operations rather than for a higher price if given the choice of the two. The tremendous cost of

the new facilities constructed puts heavy pressure on the producers to utilize them to the fullest extent, for interest and amortization charges continue inexorably regardless of the rate of output.

Irritation Caused by Commodity Price Schedule

In an effort to accomplish this the producers have put in commodity price schedules which may be described as special pricing schedules that offer prices lower than list for volume production products. The independent mills assert this is a price cutting device by the integrated mills that is wrecking their profits. Meeting this competition means cutting the per-pound price anywhere from 5 to 12 cents. The producers retort that it is a necessary and logical step to open up big new markets for aluminum products that can be mass-produced. Nevertheless, it appears clear that commodity price schedules have gone a good deal further than was originally intended and have caused some misgivings with the integrated mills themselves.

Copper Situation Confused

The copper situation remains in confusion. Early in April sentiment had measurably improved in trade circles. Sales both here and abroad were excellent. The London price inched up to 28½ cents a pound and copper futures on the Commodity Exchange climbed to nearly 30 cents, a full cent above the price of producers and smelters which had held since the first of the year. Scrap copper had advanced ¾ cent a pound, and indications were that it would not be long before the smelters would be forced to hike their price to prevent a squeeze. Heavy buying by the Japanese pre-saged a strong export market.

(Turn to page 60, please)

New P/S Klozure Oil Seal*



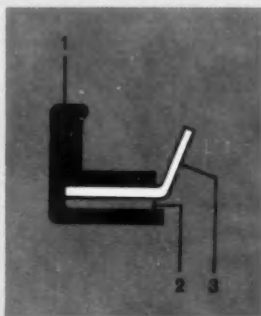
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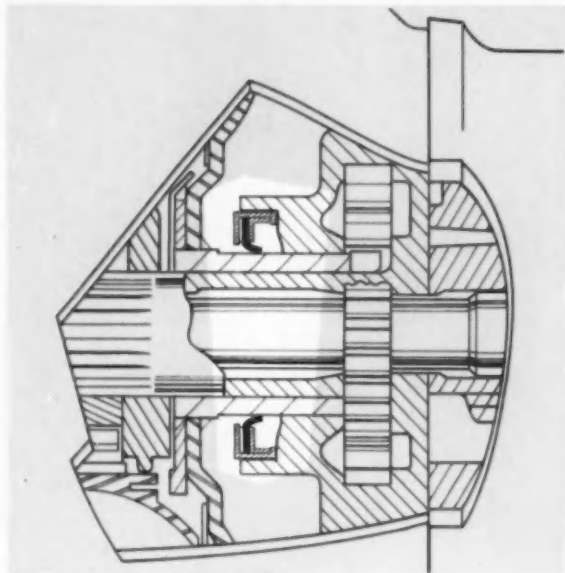
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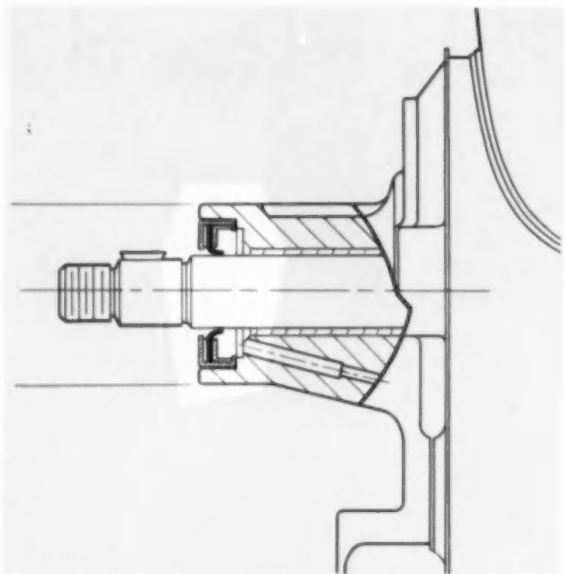
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Cutaway shows general purpose seal in position. P/S KLOZURE Oil Seals outperform all others in standard 300-hour acceptance test.

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Cutaway shows pump shaft seal in position. P/S KLOZURE Oil Seals outperform all others on standard 100-hour acceptance test.

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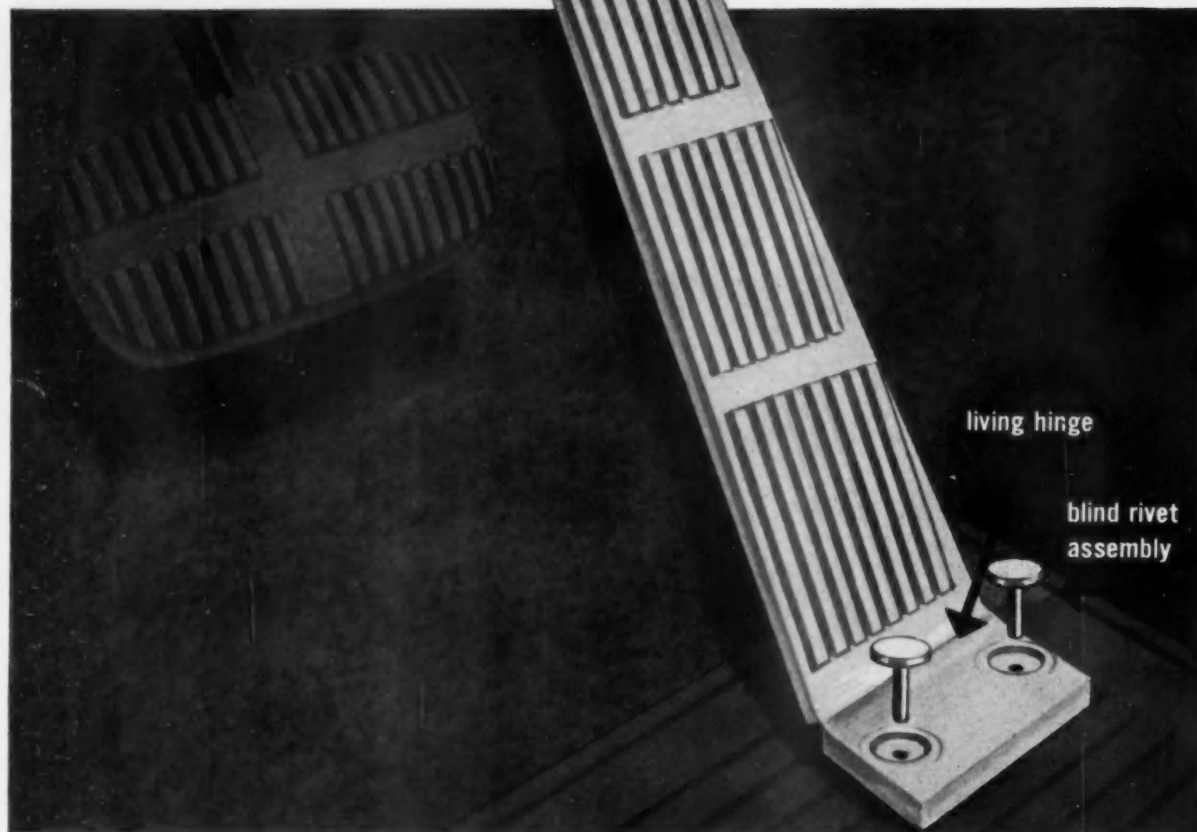


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News of the MACHINERY INDUSTRIES

Recommendations for Achieving Up-Dated U. S. Industrial Plants Are Submitted to Government by the National Machine Tool Builders' Assn. and a New England Group

By Charles A. Weinert

Industry, and Local Group Comment on Modernization

Following recent pronouncements by President John F. Kennedy on the need to "provide additional stimulus to the modernization of American industrial plants," the machine tool builders and a group of New England citizens have pointed to some of the basic factors involved in "revitalizing" industry.

Ludlow King, NMTBA executive vice-president, speaking for the machine tool builders, reports there is a "uniform determination at all governmental levels to expedite the President's expressed intention to modernize the production lines of the U.S.A." Mr. King comments:

"If the Administration and Congress, working together, can develop and put into operation effective legislation and related administrative changes to encourage immediate investment in metalworking equipment, expand credit and insurance for export business, and reduce barriers to foreign sales, the U. S. machine tool industry could be rapidly revitalized, and its output raised to match existing productive capabilities, with the possible development of a backlog of orders comparable to that in other countries."

Meanwhile, a committee of citizens in Springfield, Vt., submitted to Congress a plea for depreciation reform "to halt the Nation's dangerous drift toward deterioration of its industrial equipment."

The committee in this machine-tool producing area of New England was composed of a dairy farmer, a manufacturer, a merchant, the head of a labor union, a journalist, and Jones & Lamson

Machine Company's treasurer, Norman T. Harrison.

The committee's document urged tax depreciation reform on the premise that it strongly affects the ability of American industry to compete successfully with modern plants in Europe and the Soviet Union.

The depreciation problem, it said, stems from price inflation in the last 15 years and the fact that depreciation reserves established on the basis of original cost and present allowable depreciation rates are "woefully inadequate" to provide the funds for purchasing new equipment at current-day prices.

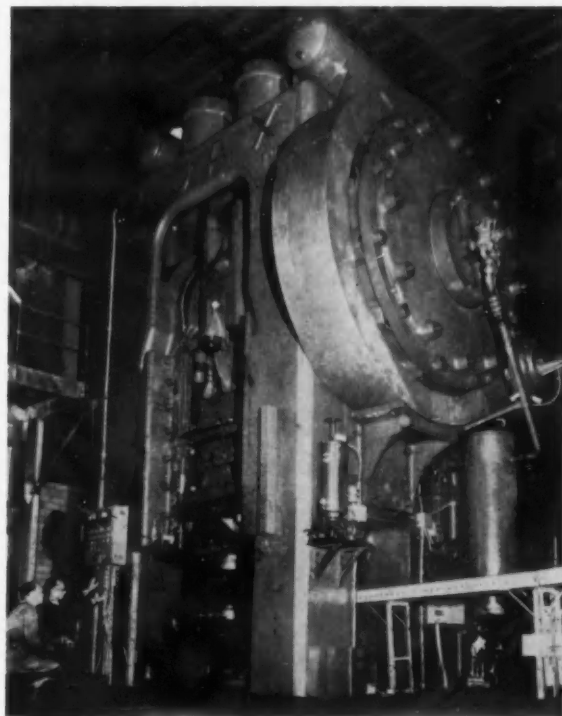
Reference was made to the lib-

eral depreciation write-offs allowed in European countries as revealed in the report of Machinery & Allied Products Institute (AI of March 1, page 52). This report showed that in two of the seven foreign countries analyzed, the first-year write-off exceeds 50 per cent; and in two others it exceeds 30 per cent. The equivalent figure for the U. S. is only 13 per cent.

Mr. Harrison of J&L, commenting as a member of the committee, said that the stimulus to investment from liberalized depreciation would augment the supply of capital funds and simultaneously increase the incentive to invest such funds. ■

Ajax Builds Automated Forging Press for Eaton

Eaton Mfg. Co., at its Marion (Ohio) Div., has just placed into operation this big 6000-ton mechanical forging press. Built by Ajax Mfg. Co., the new press has been automated by combining it with a 25-ft-diam Selsa rotary hearth furnace and conveyor set-up. Forging blanks are heated to 2200 F in the furnace, then fed automatically by conveyor and mechanical loader onto the three-stage die in the press. The press operates at 35 spm with an 18-in. stroke. Initial production will be on automotive transmission and axle gear forgings, ranging from 13 to 18½ in. diam and from 45 to 130 lb.



METALS

(Continued from page 54)

Sentiment was rudely shaken by publication of the March figures of the Copper Institute as well as by the announcement of Kennecott Copper that, because of the excellent demand for the metal, it would cancel its 13 per cent mine curtailment program that it had put into effect in February and return to a seven day week. This brought dismay to the other producers who had joined in the curtailment program and obviously threatened to disrupt plans for bringing down mine output sufficiently to balance demand and eliminate the steady increase in refined stocks.

The March figures of the Institute proved a disappointment to the trade. A much better showing had been anticipated. While mine production on a daily basis had declined in this country, reflecting the cutbacks, it had increased to over 215,000 tons for the month abroad, indicating that announced production curtailments were either not being observed or were inadequate. As a result, mine production for the Free World reached the highest point of the year and refined production exceeded deliveries to fabricators by over 18,000 tons. Refined stocks climbed to 475,000 tons at the end of March, the highest figure on record. This furnished scant encouragement for a price increase at this time. ■

The Transfer Machine

(Continued from page 41)

2075-sfpm, both at a feed rate of 172-in. per minute. Final operation is the finish-milling of the joint face in a Snyder machine, employing an 8-in. diameter milling cutter operating at the rate of 2000-sfpm with feed rate of 172-in. per minute.

Oldsmobile process engineers believe that these speeds and feeds will be largely increased as more experience is gained.

Next is the example of the Buick V-8 aluminum cylinder block. Here again the highest cutting speeds are associated with milling operations. Here are some specific examples:

1. 6-in. diameter cutter is operating at 2000-sfpm, with feed rate of 150-in. per minute.
2. 5½-in. diameter cutter is operating at 3000-sfpm, with feed rate of 150-in. per minute.
3. 18-in. diameter cutter is operating at 2000-sfpm, with feed rate of 150-in. per minute.
4. 3½-in. diameter cutter is operating at 2000-sfpm, with feed rate of 120-in. per minute.
5. A 10-in. diameter cutter operating at 1155-sfpm, with feed rate of 16-in. per minute, cutting on the O.D. as well as the face.

Problems in Converting for Aluminum

One of the major problems incident to the installation of this transfer machine line was in the conversion of equipment originally designed for machining cast iron dry to wet aluminum cutting. This required the installation of coolant systems, filtering units of several types, special plumbing, and a system of pumps among other things. In the process Buick found it necessary to provide 14 different coolant filtration systems, each one handling a prescribed section of the machine line.

One of these systems requires a heavier concentration of soluble oil for deep hole drilling the oil gallery holes. Here it is necessary to circulate the oil at a pressure ranging from 400 to 600 psi for forcing the chips out of the holes and to keep the drills cool. Another small system circulates mineral seal oil exclusively for gun boring the tappet holes, and two other small units circulate mineral seal oil to the two cylinder bore honing machines.

Detroit Transmission Division of General Motors has in operation three makes of transfer machines—Buhr, Cross, and Snyder—for machining three different types of die-cast aluminum transmission covers. These machines were specifically designed for optimum performance and as a result surface cutting speeds vary from 120-sfpm to a really dramatic rate of 10,000-sfpm for milling.

It is obvious from the sampling given above that as more parts shift to aluminum the next generation of transfer machines will have to embody provisions for cutting at rates many times those

in use today, not only for milling but for the gamut of other operations such as boring and drilling. Better provisions will have to be made for handling cutting fluids not only from the standpoint of high flows but for means of containing the cutting fluid within the machine. Means will have to be found to prevent the escape of fluid outside the machine; as well as to eliminate or control the heavy spray. ■

The foregoing article is from a paper presented by the author at the May 1 meeting of the New York Chapter of the American Society of Tool and Manufacturing Engineers.

Deere Waterloo Works

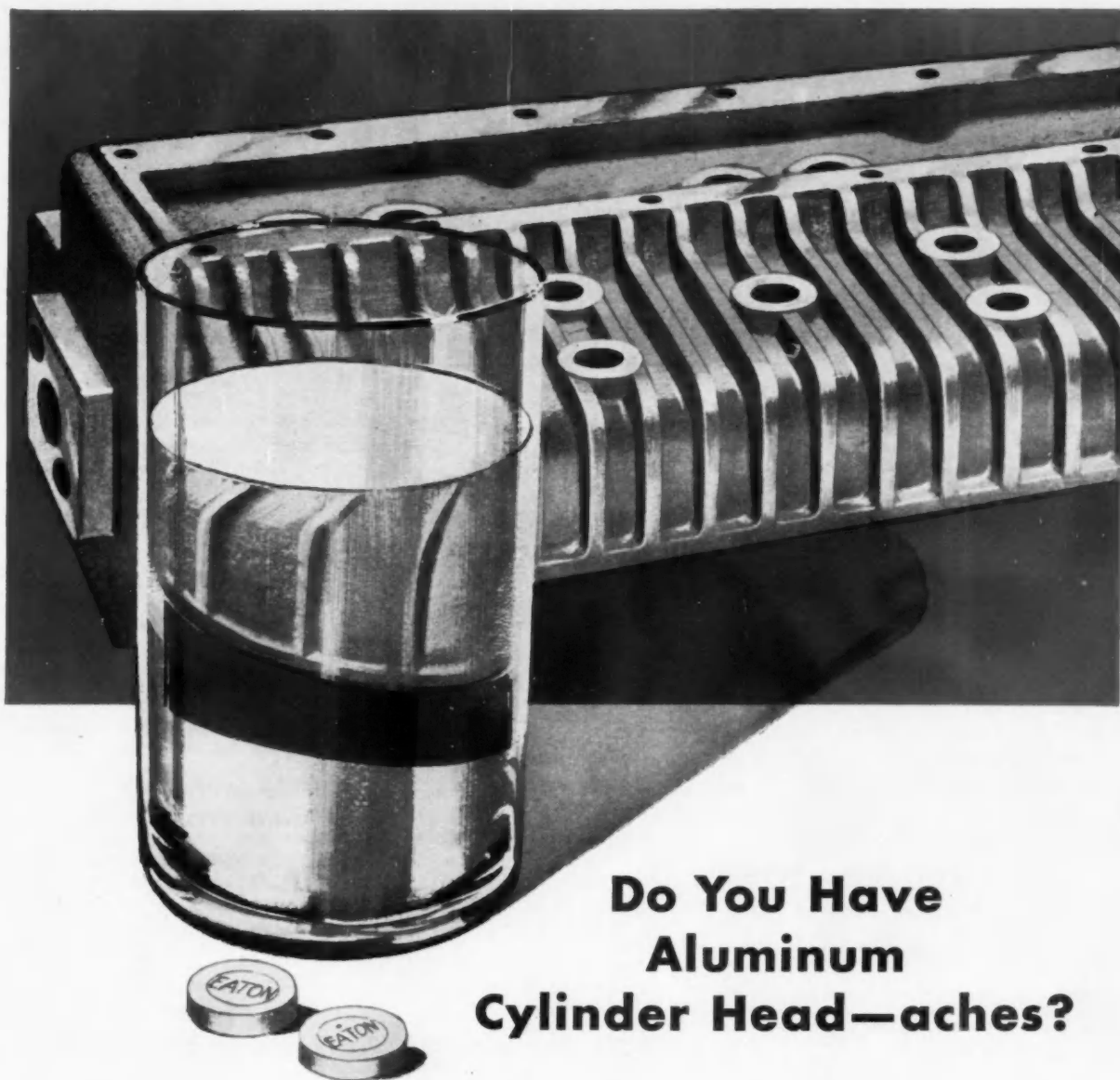
(Continued from page 53)

blown out, and the notches are burred. The final operation, weighing and classifying the rods, is done automatically on a machine built by H & H Machine Tool Co. to John Deere specifications. In it the connecting rods are automatically weighed as they move from a roller conveyor onto the machine table, and are pushed into one of four channels by the machine.

Weights are segregated in 0.04-lb increments, each channel containing three weight groups. To differentiate groups, each rod is spray marked with a code color as it moves down the channel. The spray marking is also done automatically, the correct spray being activated from the weighing position. Of the 12 classifications, only 10 are used, the two extremes being culls. At assembly, rods of the same weight classification are assembled into the same engine.

As the pistons are similarly classified by weight and color coded, and are assembled by weight classification, there is a minimum of weight variation, and so of imbalance, in the moving parts. The maximum permissible weight variation within a set of pistons and rods under company specification is 0.1-lb, but the classification holds actual variation much closer than that figure.

Before going to assembly, the connecting rods are flushed with oil and blown off in a bench operation at the engine assembly line. ■



Do You Have Aluminum Cylinder Head—aches?

For a number of years Eaton has been working on the special problems posed by the design and production of aluminum engines—particularly in the field of hydraulic lifters, tappets, valves, valve seat inserts, and replaceable valve guides.

The knowledge and data developed by Eaton research and experimentation are at your disposal. Eaton engineers will welcome an opportunity to make suggestions that may be just the "cure" you're looking for. Why not call on us now.



EATON

— SAGINAW DIVISION —
MANUFACTURING COMPANY
9771 FRENCH ROAD • DETROIT 13, MICHIGAN

INDUSTRY STATISTICS

By Marcus Ainsworth, STATISTICAL EDITOR

WEEKLY U.S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

| Make | Weeks Ending | | Year to Date | |
|------------------------------------|--------------|---------|--------------|-----------|
| | April 10 | April 8 | 1961 | 1960 |
| PASSENGER CAR PRODUCTION | | | | |
| Total—American Motors..... | 7,051 | 6,495 | 86,976 | 156,760 |
| Chrysler..... | 2,213 | 2,225 | 26,916 | 30,629 |
| DeSoto..... | | | | 13,203 |
| Dodge..... | 2,604 | 1,449 | 31,198 | 128,290 |
| Imperial..... | | 324 | 2,423 | 6,309 |
| Lancer..... | 830 | 984 | 10,337 | |
| Plymouth..... | 2,952 | 4,136 | 43,406 | 86,668 |
| Valiant..... | 2,437 | 2,043 | 28,233 | 84,737 |
| Total—Chrysler Corp..... | 11,116 | 11,163 | 142,513 | 361,836 |
| Comet..... | 3,952 | 4,146 | 36,830 | 27,453 |
| Buick..... | 11,583 | 10,842 | 118,082 | 152,819 |
| Ford..... | 14,321 | 17,535 | 210,794 | 369,742 |
| Lincoln..... | 825 | 607 | 9,408 | 6,334 |
| Mercury..... | 2,662 | 2,708 | 26,255 | 61,402 |
| Total—Ford Motor Co..... | 33,343 | 35,638 | 401,369 | 619,750 |
| Buick..... | 4,172 | 580 | 48,565 | 101,037 |
| Cadillac..... | 1,741 | 3,348 | 19,146 | 49,993 |
| Chevrolet..... | 3,391 | 3,446 | 49,993 | 57,561 |
| Chevair..... | 26,676 | 25,329 | 348,251 | 579,440 |
| Oldsmobile..... | 8,793 | 7,468 | 100,330 | 102,072 |
| Oldsmobile F-85..... | 5,374 | 678 | 66,719 | 133,555 |
| Pontiac..... | 1,291 | | 19,111 | |
| Pontiac..... | 5,121 | 854 | 63,938 | 150,555 |
| Tempest..... | 2,773 | 24 | 32,531 | |
| Total—General Motors Corp..... | 61,324 | 38,301 | 748,564 | 1,124,520 |
| Total—Studebaker-Packard Corp..... | 1,290 | 1,238 | 15,784 | 39,962 |
| Checker Motors..... | 182 | 182 | 1,842 | 2,184 |
| Total—Passenger Cars..... | 114,276 | 82,907 | 1,396,868 | 2,308,012 |
| TRUCK AND BUS PRODUCTION | | | | |
| Chevrolet..... | 6,631 | 6,986 | 91,624 | 155,393 |
| G. M. C..... | 1,342 | 1,354 | 19,560 | 36,586 |
| Diamond T..... | 53 | 52 | 501 | 923 |
| Divco..... | 48 | | 752 | 1,332 |
| Dodge and Fargo..... | 1,469 | 1,474 | 18,168 | 26,168 |
| Ford..... | 7,282 | 7,484 | 96,323 | 119,032 |
| F. W. D..... | 19 | 14 | 247 | 366 |
| International..... | 3,415 | 3,150 | 40,829 | 42,743 |
| Mack..... | 187 | 179 | 2,817 | 4,217 |
| Studebaker..... | 131 | 177 | 2,191 | 4,147 |
| White..... | 357 | 318 | 4,959 | 5,864 |
| Willis..... | 2,479 | 2,399 | 31,903 | 40,118 |
| Other Trucks..... | 80 | 80 | 1,120 | 1,846 |
| Total—Trucks..... | 23,493 | 23,577 | 310,995 | 439,275 |
| Buses..... | 120 | 80 | 985 | 1,131 |
| Total—Motor Vehicles..... | 137,869 | 116,644 | 1,708,863 | 2,747,287 |

NEW FOREIGN CAR REGISTRATIONS*

| FEBRUARY | | | |
|--------------------|--------|-------------------|--------|
| 1961 | | 1960 | |
| Volkswagen..... | 13,232 | Volkswagen..... | 11,486 |
| Renault..... | 3,152 | Renault..... | 6,883 |
| Opel..... | 941 | English Ford..... | 2,809 |
| Mercedes Benz..... | 714 | Opel..... | 2,525 |
| Volvo..... | 709 | Fiat..... | 2,114 |
| Fiat..... | 701 | Simca..... | 1,409 |
| Triumph..... | 639 | Vauxhall..... | 1,264 |
| English Ford..... | 613 | Hillman..... | 1,206 |
| Simca..... | 540 | Triumph..... | 1,169 |
| Austin Healey..... | 538 | Volvo..... | 1,156 |
| All Others..... | 4,993 | All Others..... | 10,853 |
| Total..... | 26,772 | Total..... | 42,704 |
| TWO MONTHS | | | |
| 1961 | | 1960 | |
| Volkswagen..... | 26,657 | Volkswagen..... | 23,484 |
| Renault..... | 4,912 | Renault..... | 12,962 |
| Opel..... | 1,965 | English Ford..... | 5,621 |
| Mercedes Benz..... | 1,506 | Opel..... | 4,895 |
| Fiat..... | 1,407 | Fiat..... | 4,070 |
| Volvo..... | 1,388 | Simca..... | 2,835 |
| Triumph..... | 1,242 | Vauxhall..... | 2,604 |
| Simca..... | 1,076 | Hillman..... | 2,371 |
| Metropolitan..... | 1,054 | Volvo..... | 2,269 |
| English Ford..... | 10,051 | Triumph..... | 2,168 |
| All Others..... | | All Others..... | 19,809 |
| Total..... | 52,396 | Total..... | 83,188 |

TRACTOR SHIPMENTS

WHEEL TYPE

| Hp Ratings | February | Two Months |
|---------------------------|---------------------|---------------------|
| 9-34 belt hp..... | 2,196 | 3,935 |
| 35-39 belt hp..... | 2,571 | 4,849 |
| 40-44 belt hp..... | 1,679 | 3,220 |
| 45-49 belt hp..... | 2,162 | 3,992 |
| 50-59 belt hp..... | 4,147 | 7,578 |
| 60 belt hp. and over..... | 6,177 | 12,174 |
| Total—Wheel Type..... | 18,932 ¹ | 35,742 ² |

TRACKLAYING TYPE

| | | |
|----------------------------------|--------------------|--------------------|
| 25-59 net engine hp..... | 644 | 1,524 |
| 60-129 net engine hp..... | 494 | 982 |
| 130 net engine hp. and over..... | 500 | 912 |
| Total—Track Type..... | 1,638 ³ | 3,418 ⁴ |

¹—Valued at \$48,306,000
²—Valued at \$91,275,000

³—Valued at \$18,824,000
⁴—Valued at \$35,876,000

1961 NEW REGISTRATIONS*

Arranged in Descending Order According to the 1961 Two Months Totals

| NEW CARS | | | | | | NEW TRUCKS | | | | | |
|----------------------|---------------|--------------|---------------|------------|---------|--------------------|---------------|--------------|---------------|------------|--------|
| Make | February 1961 | January 1961 | February 1960 | Two Months | | Make | February 1961 | January 1961 | February 1960 | Two Months | |
| | | | | 1961 | 1960 | | | | | 1961 | 1960 |
| Chevrolet..... | 100,892 | 108,287 | 124,745 | 209,179 | 227,401 | Chevrolet..... | 19,898 | 21,519 | 24,111 | 41,417 | 41,916 |
| Ford..... | 86,863 | 92,624 | 112,699 | 179,487 | 215,553 | Ford..... | 19,937 | 20,123 | 21,460 | 40,060 | 40,210 |
| Pontiac..... | 23,824 | 27,494 | 29,619 | 51,308 | 54,202 | International..... | 6,060 | 6,074 | 8,194 | 12,134 | 15,602 |
| Rambler..... | 21,684 | 25,344 | 29,123 | 47,028 | 55,704 | G. M. C..... | 4,615 | 5,172 | 5,150 | 9,787 | 9,150 |
| Oldsmobile..... | 20,437 | 24,361 | 26,721 | 44,798 | 50,502 | Dodge..... | 2,561 | 2,830 | 2,993 | 5,391 | 5,653 |
| Plymouth..... | 19,874 | 22,199 | 33,767 | 42,073 | 60,713 | Volkswagen..... | 1,495 | 1,591 | 2,244 | 3,086 | 4,419 |
| Buick..... | 16,830 | 20,568 | 20,492 | 37,515 | 39,423 | Willis Truck..... | 1,524 | 1,552 | 1,431 | 3,076 | 2,726 |
| Dodge..... | 14,409 | 16,178 | 26,061 | 30,587 | 46,137 | White..... | 825 | 871 | 1,028 | 1,696 | 2,260 |
| Comet..... | 11,099 | 11,985 | | 22,954 | | Willis Jeep..... | 731 | 780 | 627 | 1,511 | 1,197 |
| Cadillac..... | 10,472 | 11,784 | 12,559 | 22,256 | 23,547 | Mack..... | 523 | 606 | 852 | 1,129 | 1,700 |
| Mercury..... | 7,769 | 9,220 | 13,493 | 16,969 | 25,314 | Studebaker..... | 404 | 330 | 138 | 734 | 265 |
| Chrysler..... | 5,427 | 6,671 | 6,327 | 12,098 | 11,803 | Divco..... | 172 | 225 | 276 | 397 | 508 |
| Studebaker..... | 4,607 | 6,444 | 9,032 | 11,051 | 16,902 | Diamond T..... | 117 | 178 | 186 | 295 | 403 |
| Lincoln..... | 2,494 | 2,797 | 2,219 | 5,291 | 4,555 | Kenworth..... | 69 | 61 | 101 | 130 | 223 |
| Imperial..... | 787 | 1,123 | 1,423 | 1,920 | 2,879 | Brookway..... | 66 | 57 | 90 | 123 | 178 |
| Misc. Domestic..... | 567 | 873 | 3,084 | 1,540 | 6,331 | F. W. D..... | 74 | 37 | 49 | 111 | 89 |
| Foreign..... | 26,772 | 29,884 | 42,704 | 52,396 | 83,188 | Peterbilt..... | 25 | 48 | 72 | 73 | 175 |
| Total—All Makes..... | 374,877 | 413,663 | 494,178 | 788,440 | 924,294 | All Others..... | 236 | 253 | 574 | 489 | 1,148 |

* Compiled from official state records. Data property of R. L. Polk & Co. May not be copied, sold or reprinted without Polk permission.

NEW

PRODUCTION and PLANT

EQUIPMENT

By C. J. Kelly

ASSISTANT EDITOR

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Metal Cutting Saw

MODEL L-9, horizontal metal cutting band saw, features a new 4 speed drive. Speeds available with this new model are: 50, 90, 120 and 260 fpm. Cutting capacity of the L-9 is 9 by 16 in. The blade motor is a $\frac{3}{4}$ hp unit and blade size is 11 ft 6 in., by $\frac{3}{4}$ in., by 0.032. Overall measurements are: height, 40 in.; width, 67 in.; front to back, 35 in. When equipped with coolant the total weight is 500 lb. *W. F. Wells and Sons, Inc.*

Circle 45 on Inquiry Card for more data

Directional Valves

MINIATURE directional valves have been introduced in a new line for oil hydraulic systems.

The new valves are designed for use in small volume systems typically used for jig positioning and clamping, hydraulic gear shifting and clutching on machine tools, and venting on hydraulic system relief valves. They are suitable for operation to 1000 psi and have a maximum capacity of 2 gpm. Simple, long life a c

and d c solenoids, with low current consumption, are available in all standard voltages.

These gasket-mounted valves, designated DIL, are offered as 4 way valves in both single solenoid and double solenoid models. They are available with a variety of spool types to suit operating requirements.

The valves include alternate $\frac{1}{8}$ in. pipe thread cylinder port connections located opposite the mounting face which contains the four normal port openings. This design is particularly suitable when mounting a series of valves on a manifold with lines directly connecting the valves and the actuating members of the circuit. *Vickers Inc.*

Circle 46 on Inquiry Card for more data

Air Cylinder Series

THIS new air cylinder, series K, rated 200 psi, has been designed to meet all JIC standards. Construction features include a cold drawn brass cylinder barrel; chrome plated, high tensile steel piston rod with a minimum yield strength of 90,000 to

100,000 psi; rolled steel heads; and extra long cartridge-type rod bearings. Fabricated steel mounts and accessories have been designed for precision mounting and are available for bore sizes from $1\frac{1}{2}$ to 14. in. *Ortman-Miller Machine Co.*

Circle 47 on Inquiry Card for more data

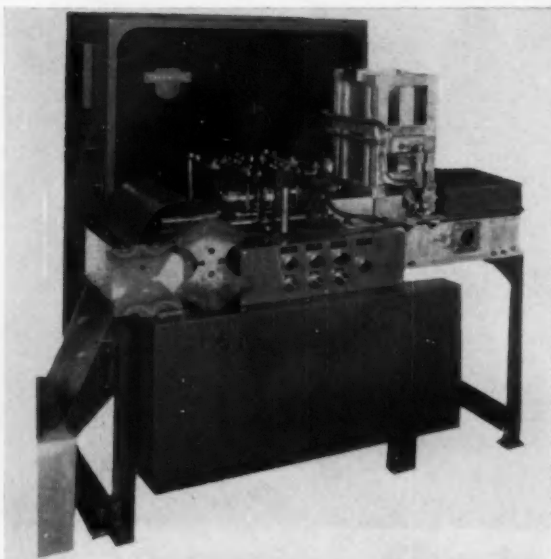
Copying Machine



A single control sets this new Copyflex Model 61 machine for high volume production of copies. It will produce up to 3000 lettersize copies per hour. It will also produce 11 by 17 in. copies. The machine is manufactured by the Charles Bruning Co., Inc.

Circle 48 on Inquiry Card for more data

Auto Brackets Annealed Automatically in 4 Seconds



This unit will anneal auto brackets with perfect uniformity while handling all parts simultaneously and automatically. The work table and coil automatically anneals four sections of two differently sized plates at a production rate of $3\frac{1}{2}$ seconds per plate, using a 25KW induction heating generator. The work table consists of an automatic hopper, indexing conveyor and the work coil. The steel plates used in this operation are 1020 HR steel. The heated area on either plate is approximately 5 sq in. to 1400 deg F. *Induction Heating Corp.*

Circle 49 on Inquiry Card for more data

Tumbling Barrel

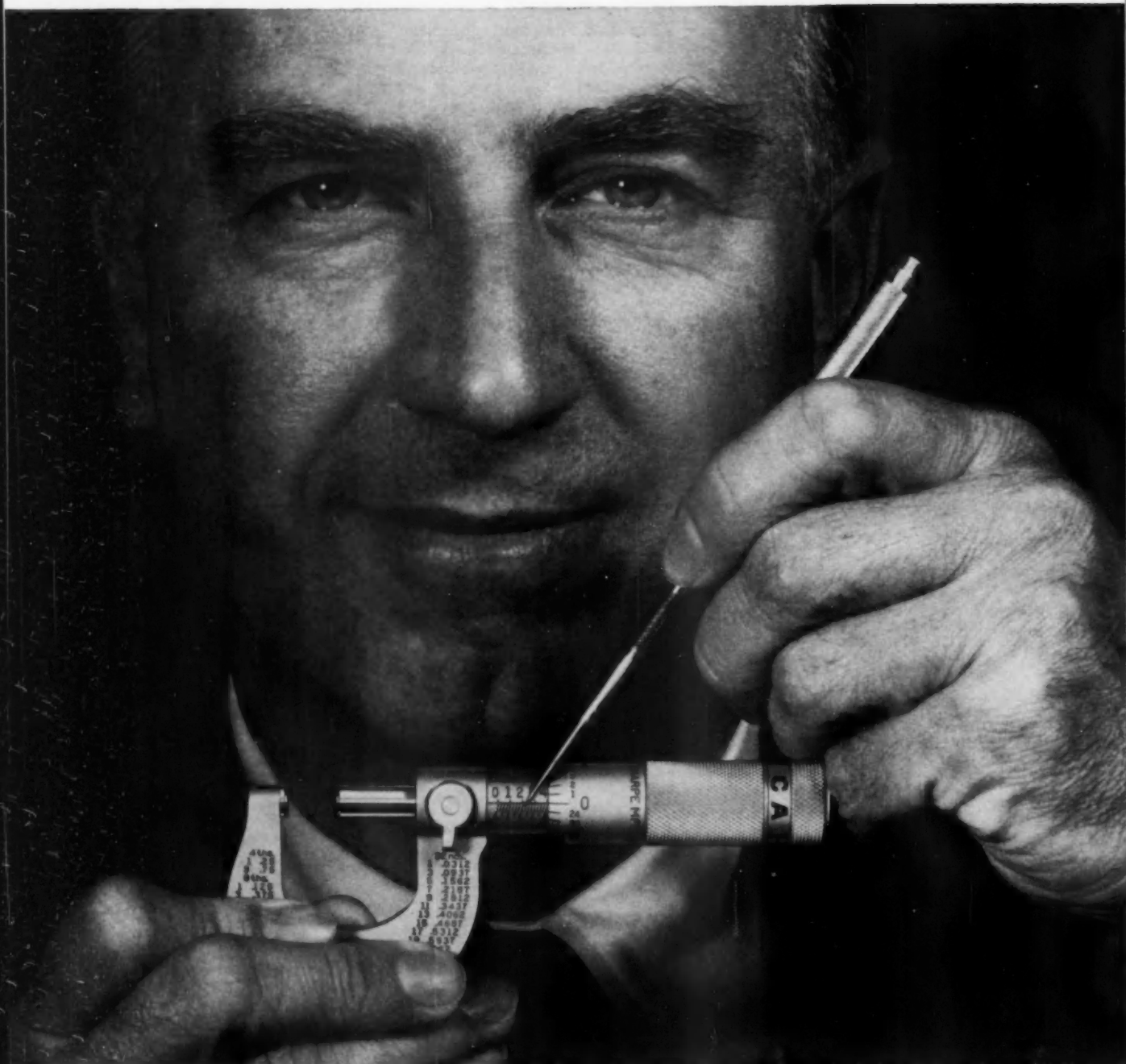
EXACT control to obtain a wide range of finishes is featured on a new vibrating-tumbling barrel. This Vibrothone unit is equipped with variable speed drive and motor to give the operator simultaneous control of frequency and degree of vibration. Vibration, rotation and vibration with rotation are possible. The unit has no springs and is supported by rubber mounts. The vibration is caused by an eccentric drive principle. The barrel of the unit is detachable. *Minnesota Mining and Mfg. Co.*

Circle 50 on Inquiry Card for more data
(Turn to page 69, please)

A "live" demonstration from Brown & Sharpe...

"Let me show you how Brown puts a stop to .025" errors -

... Mr. Thomas C. Roberts, Manufacturing Manager,



"Look, the barrel graduations are **SLANTED** on this new B&S No. 1011 Micrometer." (0-1" by .0001.")

"They can't suddenly hide under the end of the thimble, the way right-angle graduations on other mikes do — can't trick you into reading the wrong .025"

line. They make it clear where you're going and where you've been. Even when you're tired or working in bad light, you read the slant-line right.

& Sharpe's new '*slant-line*' mike boosts accuracy in your shop!"

Brown & Sharpe, Industrial Products Division



"I don't need to tell you how much trouble the old '25-thousandth error' has caused over the years. But the slanted graduations on our new Brown & Sharpe mikes put an end to it, once and for all!"



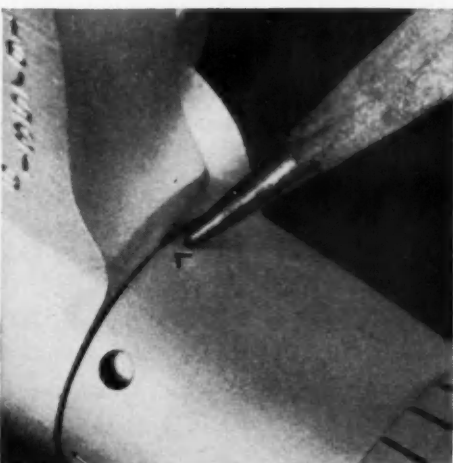
"Do you like a solid-type thimble, or a 'friction' type? A twist of a knob converts the entire thimble to the type of action you prefer. Operation is identical, using the same sleeve, in either case."



"It's a real one-hander! You can work the lever clamp, thimble and friction sleeve with one hand, even when the mike's turned out. And, notice the personal initials. — furnished at no extra charge."



"You get the corrosion resistance of a stainless steel spindle in all Brown & Sharpe micrometers with carbide faces. Faces lapped to .000030". Micrometer accuracy is guaranteed with .0001".



"Notice this Craftsman's Personal Mark. Every B&S micrometer is 'signed' twice — once by Brown & Sharpe — once by the man who assembled it to give you an extra guarantee of highest quality."



"Slant-line graduations are now available on several other models of B&S mikes, in addition to No. 1011. Check with your local industrial distributor." Brown & Sharpe Mfg. Co., Providence 1, R. I.

Brown & Sharpe  **PRECISION CENTER**

SEE B&S MICROMETERS AT THE 1961 ASTME EXPOSITION — BOOTH 1315



NEW

PRODUCTS AUTOMOTIVE-AVIATION

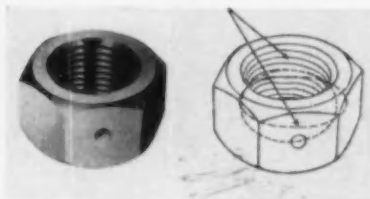
FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly
ASSISTANT EDITOR

Two-Way Lock Nut

A re-usable, double chamfered lock nut has been designed for automatic application. The double chamfer allows the nut to be applied from either side, eliminating the need for selective devices.

The locking device of the nut is in the body of the nut so that greater locking power is assured when the



nut is mounted flush with the end of the bolt or when all threads are not used. The nut uses two locking principles: It is ovalized to give 180 deg spring, and the threads are deflected at the point of lock . . . so that the nut can be locked in any position. MacLean-Fogg Lock Nut Co.

Circle 60 on Inquiry Card for more data

Free-Machining Stainless

IMPROVED machinability and other favorable attributes are claimed for a new free-machining 18.0-9.25 chromium-nickel stainless steel, called Uniloy 303MA. Although production-proven, its commercial availability has just recently been announced.

As compared with regular free-machining AISI Type 303, decreased machining time with Uniloy 303MA is said to range from 15 to 50 per cent. Therefore, while the material costs 2½ to 4 cents more per pound, representing a 3 to 4 per cent increase in material cost, savings in product cost are attainable.

In addition to better machinability and increase in tool life, the corrosion-resistance and splitting-resistance of the new material are greater. Uniloy 303MA, its maker states, has a corrosion-resistance 25 times that of Type 303 and ap-

proaches Type 304 in this respect, when tested by the Huey method. Being a "cleaner" steel, it has improved cold workability which permits successful roll-threading operations. Improved surface finish also is claimed to result.

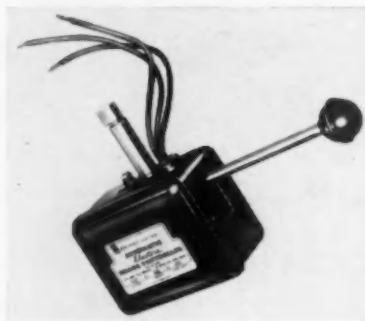
In the patented-composition 303MA alloy, the main chemical variations from Type 303 are in the sulphur and aluminum contents. The sulphur content has been reduced about in half, from .25 per cent for 303 to .13 per cent for 303MA. The aluminum content of 303MA is .70 per cent, while none is in 303. This combination of aluminum and sulphur in 303MA provides machinability with reduction of the sulphur content and thus non-metallic inclusions.

It is available from stock in popular bar sizes in the form of rounds, squares, and hexagons. Universal-Cyclops Steel Corp.

Circle 61 on Inquiry Card for more data

Electric Controller

An automatic electric controller, designed for trailer brakes, provides smoothly modulated control of electric trailer brakes. According to company engineers when the unit is con-

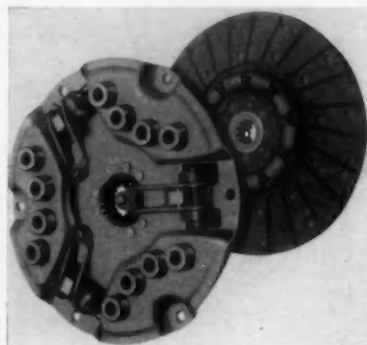


nected into the hydraulic system of the towing vehicle it operates automatically to synchronize the braking of both car and trailer, whenever the tow car brakes are applied. The unit is adjustable for varying load conditions. Kelsey-Hayes Co.

Circle 62 on Inquiry Card for more data

High-Speed Clutches

Spring loaded clutches have been specially designed to meet modern high-speed engine requirements. This new line is now available for a variety of tractor drives. These clutches are provided with a counterbalanced release lever that permits high-speed operation without increasing the pressure required to release.



The dual-drive clutches contain a built-in provision for live power take-off. This auxiliary drive runs constantly from flywheel through a splined hollow shaft. Twelve engagement springs are provided to assure maximum driving contact. Rockford Clutch Div., Borg-Warner Corp.

Circle 63 on Inquiry Card for more data

Resin Forming Liquids

In answer to the problem of corrosion and excessive replacement costs, a product called Permaspray has been developed. It is a blend of resin forming liquids suspended in a combination of suitable solvents to facilitate application. This corrosion-preventing coating does not deposit a film by evaporation of solvents, but hardens by chemical action. This action is initiated by addition of a liquid activator.

The manufacturer reports that Permaspray is not affected by Ultraviolet light or weather, and will withstand temperatures up to 200 deg F. Leonetti Enterprises.

Circle 64 on Inquiry Card for more data

KNOW YOUR ALLOY STEELS . . .

This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many who may find it useful to review fundamentals from time to time.



for Strength
... Economy
... Versatility

Determining the Proper Depth of Case in Alloy Steels

In one of the recent articles in this series we discussed the carburizing of alloy steels, pointing out that the purpose of carburizing is to provide a hard, abrasion-resistant outer shell or "case." Such a discussion naturally gives rise to the question, What factors influence the choice of case? Should it be shallow? Medium? Deep or extra-deep?

While it is not always wise to formulate hard-and-fast rules, the following may be used as a general yardstick:

Shallow cases (less than 0.02 in.). Suitable where wear-resistance alone is the chief requirement, and where good surface condition after heat-treating is advantageous. Not suitable if high stresses are apt to be encountered in service.

Medium cases (0.02 to 0.04 in.). For high wear-resistance. Will stand up under substantial service loads and stresses. The thickness is sufficient to permit certain finishing operations, such as light grinding.

Medium-to-deep cases (0.04 to 0.06 in.). For high wear-resistance. A case in this depth range is essential where continuing friction is involved, especially friction of an abrasive or semi-abrasive nature. It is also a good precautionary

measure where application of the finished part may sometimes involve crushing action.

Extra-deep cases (more than 0.06 in.). Cases of this depth can be obtained by extending the furnace time in pack carburizing. Highly wear-resistant, extra-deep cases also withstand shock and impact. A large camshaft of an internal-combustion engine is a good example of a part requiring the extra-deep case. This is especially true of the cam lobes themselves.

If you need advice concerning case-hardened parts, let us arrange for one of our metallurgists to assist you. Bethlehem engineers are always on call, and you can depend on their recommendations. And you can depend on Bethlehem, too, when you need alloy steels; for Bethlehem makes the full range of AISI standard grades, as well as special-analysis steels and all carbon grades.

This series of alloy steel advertisements is now available as a compact booklet, "Quick Facts about Alloy Steels." If you would like a free copy, please address your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL





HUMAN EAR

No longer needed
to

SOUND-TEST GEARS



The inspector's hearing and his judgement have not always been dependable in discriminating between gear noise which may be tolerated and that which may not. In fact, these human qualities are not consistent even in the same individual at all times.

To avoid such inconsistencies, the Red Ring Sound Tester may now be equipped with an electronic broad-band amplifier. Sound intensity is measured and the result indicated on a graduated visual scale. Thus, it is simple to establish sound tolerance limits independent of the human equation and maintain uniform quality.



SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING,
GEAR HONING AND ELLIPTOID

For further information write for Bulletin C 60-8

NATIONAL BROACH & MACHINE CO.

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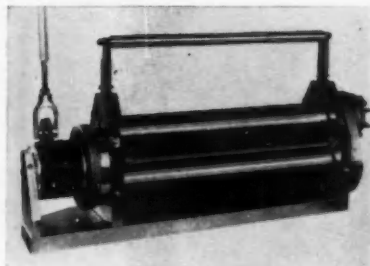
WORLD'S LARGEST PRODUCER OF GEAR SHAVING AND HONING EQUIPMENT

NEW PRODUCTION and PLANT EQUIPMENT

(Continued from page 63)

Precision Roll Feed

Precision roll feeds, series 9PRF, have been introduced with roller lengths suitable for 15 in. stock widths. The series has an adjustable stroke of 0 to 9 in. The stroke length is obtained with a set of fully enclosed gears.



The bottom feed roller is 3 3/4 in. in dia and is hollow to reduce inertial lag and momentum. Operating speeds up to 200 sfm can be obtained with this device. Heavy roll pressure is maintained by spring load.

Roll lifters are actuated by the roller bar across the top. The actu-

ating bar swings 180 deg to either side when in operating position. *Benchmaster Mfg. Co.*

Circle 51 on Inquiry Card for more data

Torque Transducer

A TORQUE transducer for torque sensing on tests of electric motors, generators, stepping motors, clutches and brakes, bearings, potentiometers, or any other rotating device is now available. Models are available in ranges from 50 in. oz to thousands of in. lb.

The case reaction of the test unit mounted to the table is measured by means of bonded strain gages on special flexure straps that eliminate all friction error sources (such as bearings and linkages).

Since no slip rings are employed, there is no limitation to speed of rotation and no maintenance requirements of bearings or brushes as with conventional rotary torque sensors. *Lebow Associates.*

Circle 52 on Inquiry Card for more data

Design Features of Buick Special and Olds F-85

(Continued from page 51)

sional vibration is arrested by a rubber mounted damper attached to the front of the shaft.

Oldsmobile electronically balances the "Rockette" engine while it is running on the test stand in the engine plant. Balancing is done at both the front and rear of the engine by driving pins in drilled holes in the crankshaft dampener at the front and the fly-wheel at the rear.

Exhaust Manifolds

Buick—The cast iron exhaust manifolds have passages with gradually increasing cross-sectional areas to minimize resistance to flow of the burned gases.

The right manifold incorporates a heat stove, which in conjunction with a stainless steel tube running through the manifold proper, supplies heated air to actuate the carburetor automatic choke. No heat valve with its potential sticking or rattle problem is used since the intake manifold is water-heated.

A ball-type flange is used at the exhaust manifold to pipe junction, eliminating the need for a separate gasket and also providing flexibility for proper alignment of the exhaust system at this point.

Accomplishment

Buick—The final result of this weight-conscious approach to the design of the new Special engine is a total dry weight of 324 lb or 1.50#/cubic inch displacement (Fig. 7). A comparison with several 1960 American-built compact car engines reveals that this weight per cubic inch ratio is far superior and is the only one with a value under two pounds per cubic inch displacement. As an additional measure of the benefits of this concentrated attack on the weight problem, a comparison of the performance level in terms of pounds per horsepower output reveals a figure of 2.09 for this engine as compared to 3.50 for the nearest competitor (Fig. 8). ■

VICTOR

TYPE
K4



Victoprene on O.D. and outer face; patented lead-in bore feature. Integrally molded element and case.

TYPE
K6



Steel O.D.—Victoprene gasket on inside face. Primary lip retains lubricant; secondary lip excludes dirt, foreign matter.

PROVEN DESIGN

compact, dual-lip
oil seals

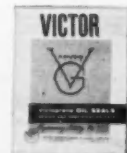
as narrow as 1/4-inch

Victor Victoprene oil seals in two types to accommodate varying installation and bore sealing needs, yet provide identical shaft sealing efficiency in even the most limited housing space.

- **DUAL SEALING SURFACES**—Inner lip retains fluid; outer lip excludes foreign matter or confines secondary lubricant.
- **VICTOPRENE ELEMENT**—Developed of improved Buna N synthetic rubber for balanced resistance to lubricants, heat, age deterioration.
- **PERMANENT PRE-LUBRICATION**—Cavity between lips holds lubrication on installation. Reduces frictional drag; extends seal life.
- **NARROW WIDTH**—One-piece integral molded construction for most compact seal housing.
- **POSITIVE SPRING LOCATION**—Molded groove retains spring; uniform pressure on shaft assured. Both types available without spring.
- **POSITIVE BORE SEALING**—Type K4 has bonded-to-case Victoprene on O.D. and outer face; lead-in allows easy installation. K6 has steel O.D. with integral gasket on inside face for bottom of bore seal.

WRITE FOR CATALOG...

Covers above types and all varieties of Victor oil seals; includes service recommendations. Useful to specifiers and buyers. Victor Mfg. & Gasket Co., P.O. Box 1333, Chicago 90, Ill. Canadian plant: St. Thomas, Ontario.



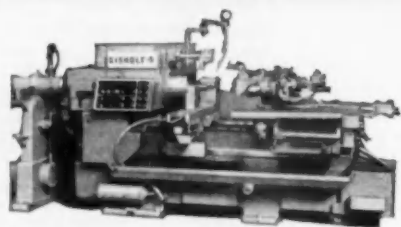
VICTOR

Sealing Products Exclusively

OIL SEALS • GASKETS • PACKINGS
MECHANICAL SEALS

Circle 144 on Inquiry Card for more data

SOMEBODY is doing it for LESS



GISHOLT MASTERLINE AR TURRET LATHE Converts for bar or chucking work in less than one hour. Sets up like a turret lathe, from the front—no gears to change—uses same standard tools. Cycle setting is learned in less than a day. Compare these extras: greater capacity at lower original cost than any comparable automatic; automatic withdrawal for chip clearing in deep holes; internal threading with solid taps requiring spindle reverse; external threading with self-opening die heads and automatic re-cocking; reverse feed and individually adjustable dwell to all tool stations; 16 spindle speeds and infinite feeds—none lost when threading. Optional: 8-sided turret; overhead cut-off slide or swinging stock stop; automatic recessing slide tools; turret mounted JETracer® slide tools.

Ask your Gisholt Representative for a desk-side demonstration, or write for Catalog 1224.

Turret Lathes • Automatic Lathes • Balancers • Superfinishers® • Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantee

With recent developments in automatic machining, many manufacturers—maybe your toughest competitors—are cutting costs substantially.

Even small runs are going automatic—both bar and chucking work too! All this with the Gisholt AR® Turret Lathe at little more than the cost of a hand-operated turret lathe.

This is no exaggeration: the Gisholt AR can cut your *direct* machining costs by 25% to 40% on work now handled on manual lathes—can give you *indirect* savings in tooling, inventory, setup, inspection, materials handling and floor space. Investigate AR—your best answer to the cost-profit squeeze.



GISHOLT

MACHINE COMPANY
Madison 10, Wisconsin, U.S.A.

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More and more automobile manufacturers are turning to molded plastics because of their versatility, utility and low cost. Typical of Plastene's unique and varied contributions to the automotive field is one of its recent developments—an in-line nylon gasoline filter bowl body. Plastene not only designed this rugged unit but performed the intensive evaluation and testing required to assure optimum performance and long life.

What does Plastene's rigid emphasis on precision mean? It means that Plastene draws on its outstanding engineering and fabrication skills to control every step of the manufacturing process. Which, in turn, means that every item from the beginning to the end of each production run is turned out to Plastene's uncompromising quality standards.

Plastene's unusual skills and abilities, its three strategically located plants in Crawfordsville, Ind., Norwich, Conn., and Anaheim, Calif., are available to you. Plastene offers you a world of polystyrene, polyethylene, acrylic, polypropylene, acetate, delrin and nylon automotive products—made to Plastene precision standards. Write today for complete information.



PLASTENE

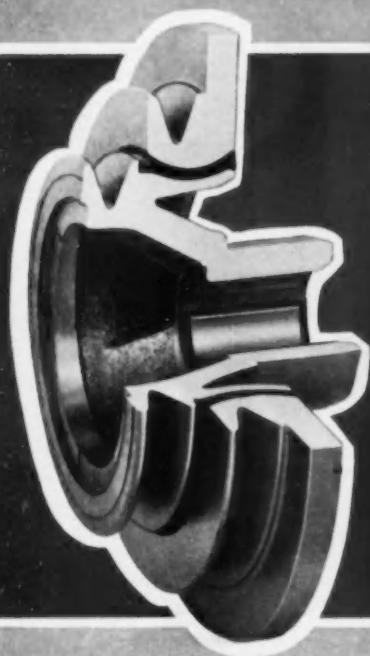
Plastene Corporation, Crawfordsville, Indiana • Subsidiary of The American Thermos Products Company

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another engineering development of

SCHWITZER



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damper requirements
of modern, high output engines*

*Let the "New Approach" by Schwitzer
help solve your most complex problems
in Vibration Damping and Isolation*

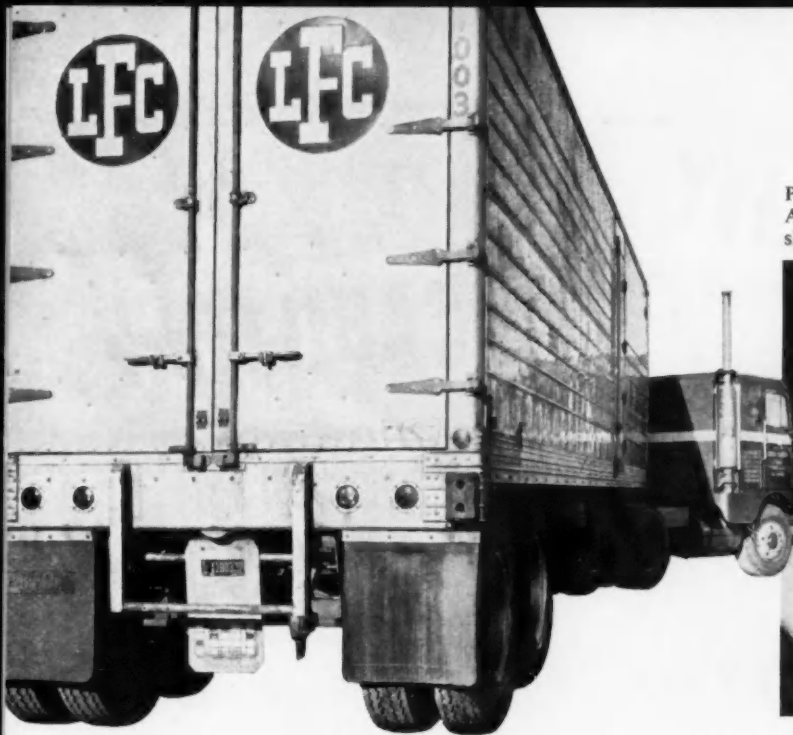
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CORPORATION**

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SCHWITZER PRODUCTS ARE MANUFACTURED INTERNATIONALLY



Poured-in-place Glidfoam fills all voids, leaves no air leaks. And Glidfoam bonds rigidly to trailer walls, preventing shakedown, adding structural strength.



How Glidfoam* insulation helped this reefer haul 21% more payload for 250,000 below-zero-miles

Cargo space was increased 300 cubic feet with Glidfoam poured-in-place polyurethane foam, installed in this Lipsman-Fulkerson Company reefer two years ago by the Sterling Refrigeration and Engineering Company.

The high thermal efficiency of Glidfoam provided below-zero insulation with only three inches of wall thickness, compared to the usual six inches. This increased average payload by 6000 pounds.

Additional benefits gained from Glidfoam insulation were low moisture pickup (100 pounds in twelve months compared to the usual 1000 pound pickup), complete elimination of insulation maintenance costs and greatly reduced fuel costs in operating the refrigeration unit.

For high efficiency insulation for your reefers, specify poured-in-place Glidfoam. Glidden supplies the complete two-component system. Write now for specifications.



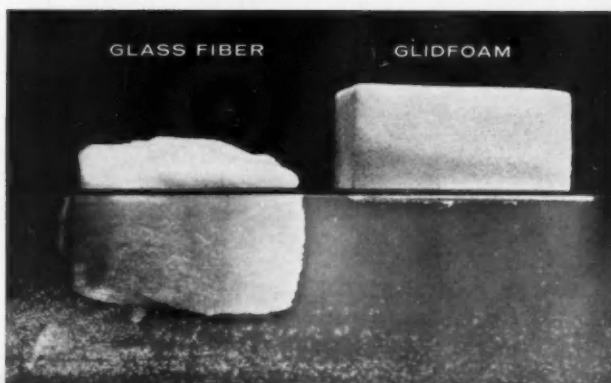
THE GLIDDEN COMPANY
INDUSTRIAL PAINT DIVISION
900 Union Commerce Building
Cleveland 14, Ohio

*Glidfoam is the trade name of Glidden polyurethane foam, registered trademark applied for.



You can carry more cargo with Glidfoam-insulated reefers. Walls can be thinner, increasing cargo space as much as 500 cubic feet in a 40-foot trailer.

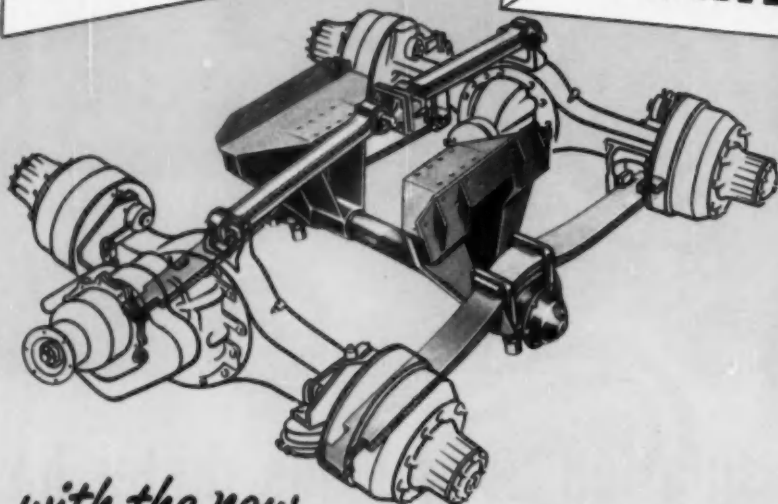
Flotation test proves Glidfoam's low water absorption. Glass fiber insulation soaks up water and sinks. Glidfoam stays high and dry. This means no maintenance, long-term insulating efficiency, no increase of dead weight with Glidfoam.



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PAYLOADABILITY

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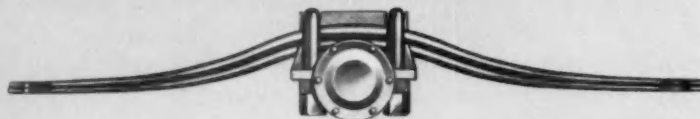
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- A SMOOTHER RIDE LOADED OR EMPTY
- LESS WEAR AND TEAR ON TRUCK AND CARGO

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ROCKWELL-STANDARD TANDEM SUSPENSION

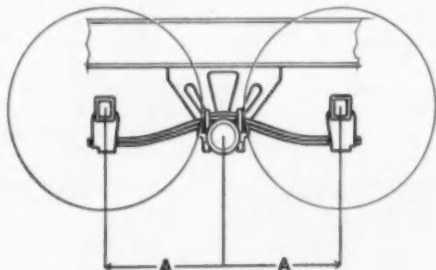
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EXCLUSIVE "TAPER-LEAF" SPRINGS
MEAN LESS WEIGHT—
MORE PAYLOAD



It isn't the amount of spring steel but the way that it is used that gives strength to springs. With only *two* long tapered leaves in each spring Rockwell-Standard can achieve the same strength and load carrying capacity that standard suspensions can carry with multi-leaves...and at less than half the weight.

Optional aluminum frame support brackets and torque rods cut suspension weights by almost 25%.



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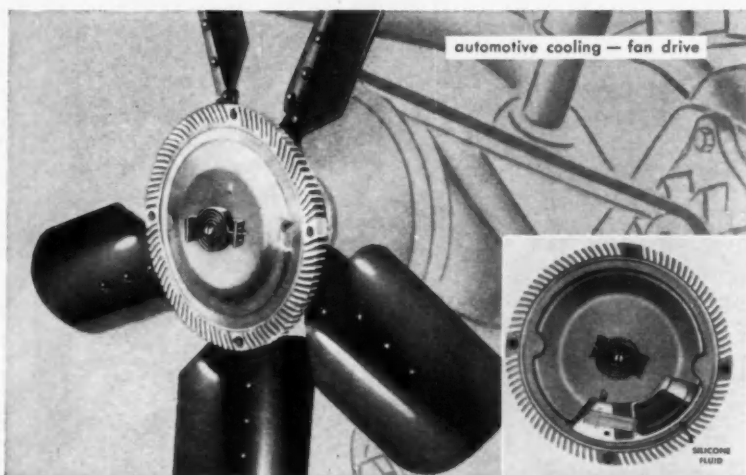


Transmission and Axle Division, Detroit 32, Michigan

BALANCED "CRADLE-RIDE" FOR SMOOTHER GOING—LOADED OR EMPTY

Balanced design with long resilient springs assures an easy buoyant ride and reduces vehicle hopping, pitching and swaying. Because of greatly reduced inter-leaf friction even slight road imperfections are absorbed. This shock absorbing action keeps vehicles tight, minimizes maintenance, reduces cargo damage and makes handling easier on or off the road.

How To Improve Designs



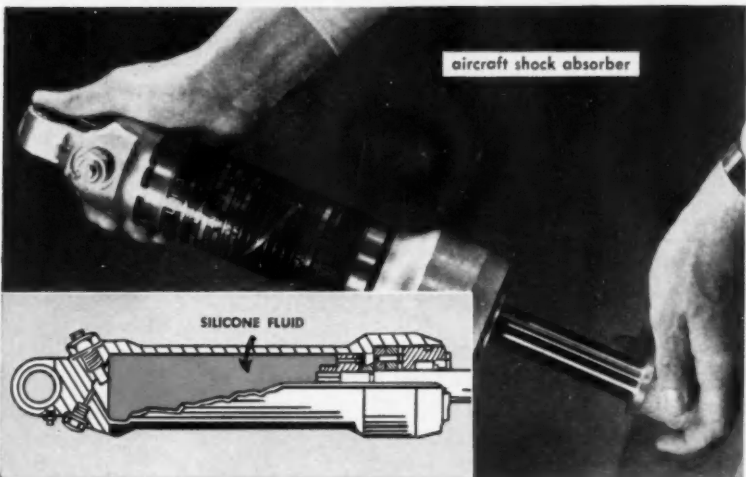
Furthermore, silicone fluids are highly resistant to breakdown due to shear; are noncorrosive.

These are the reasons silicone fluids make possible design changes impractical with other fluids . . . help improve damping devices, fluid couplings, liquid springs and hydraulic power drives. Here are two typical examples:

Unimpaired Drive Action

The Visco-Drive assembly shown opposite, designed and manufactured by Eaton Manufacturing Company, automatically slows automotive engine fans at high speeds when cooling is least needed . . . conserves horsepower and reduces noise.

Eaton engineers specify Dow Corning silicone fluid as the drive medium to assure uniform driving action over long periods of time under widely differing conditions.



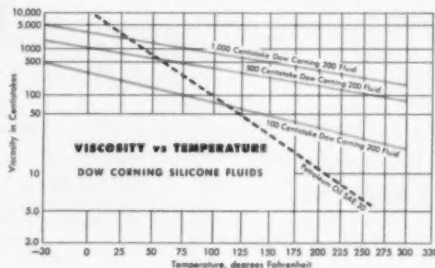
Soaks Up Shock

Another example is an aircraft shock absorber manufactured by Cleveland Pneumatic Tool Company. Because the Dow Corning silicone fluid used in this liquid spring is much more compressible than other liquids, designers were able to reduce size of the oil chamber by 30%, thus saving vital weight and space.

Silicone fluids let you forget time -- temperature

Design more efficient mechano-fluid devices. Assure reliable, uniform performance. Do both with Dow Corning silicone fluids.

Silicone fluids let you forget time because they are resistant to oxidation . . . are nongumming and nonsludging. Silicone fluids let you forget temperature because they maintain a near-constant viscosity, regardless of whether operating environment be hot or cold . . . are serviceable at temperatures as low as minus 100 F; at temperatures as high as 400 F.



Learn how other designers are putting to advantage the unusual combination of properties available only in silicone fluids. Send today for descriptive brochure. Address Dept. 0917.

Your best source for technical assistance in adapting silicones to your products is the Dow Corning office nearest you.



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**Airborne crane built 500
pounds lighter with
USS TRI-TEN High-Strength
Low-Alloy Steel**

This air transportable, air droppable U. S. Army crane had to be strong enough to lift 7 tons but light enough to be parachuted into a combat area. The Koehring Company of Milwaukee, Wisconsin, solved the problem with USS TRI-TEN High-Strength Low-Alloy Steel. □ By using USS TRI-TEN Steel in the turntable, the lower works of the cruiser, and the boom, Koehring designers used only two tons of steel . . . with a clear saving of 500 pounds. Strength was not sacrificed because USS TRI-TEN Steel has a minimum yield point of 50,000 psi. □ USS TRI-TEN Steel is well known as one of the most weldable and toughest high-strength low-alloy steels in the industry. Its superior notch toughness at low temperature makes it ideal for all-weather mobile equipment. TRI-TEN Steel has excellent weldability, good resistance to abrasion, and atmospheric-corrosion resistance that is about double that of structural carbon steel. □ For other military vehicles, United States Steel makes extremely tough, rolled alloy armor plate, in addition to a complete line of high strength steels, "T-1" Constructional Alloy Steel, Stainless Steels and carbon steels. For more information, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS, "T-1" and TRI-TEN are registered trademarks

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Lightweight crane built strong with USS TRI-TEN High-Strength Low-Alloy Steel. Designed for the U. S. Army Corps of Engineers, Ft. Belvoir, Va. Builder: Koehring Co., Milwaukee, Wis.



This mark tells you a product is made of modern, dependable Steel.



Photo courtesy Cushman Motors

R/M found friction material answers for versatile Cushman Trailster

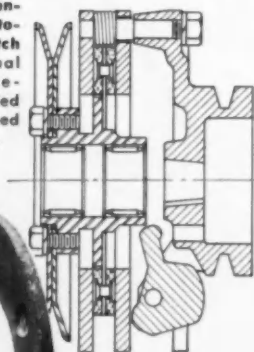
"We placed our friction problems for the Trailster's centrifugal automatic clutch in Raybestos-Manhattan's hands," says R. D. Von Seggern, assistant chief engineer, Cushman Motors, Lincoln, Nebr.

"Cushman has been using Raybestos-Manhattan friction materials in various models of utility vehicles for over 15 years. Based on past experience, we know we can rely on them for assistance at every stage—from design to production.

"We needed a friction material capable of withstanding high heat generated by slippage until the centrifugal clutch engaged. It had to have a uniform coefficient of friction over a wide temperature range and low wear characteristics. R/M was able to develop a molded material which meets these requirements."

Why not take a tip from Mr. Von Seggern—call on us and make use of our knowledge of friction accumulated from 50 years of experience. Just phone or write—a sales engineer can be at your desk within 24 hours. Remember . . . only R/M makes all types of friction materials; your assurance of unbiased council.

Cushman centrifugal automatic clutch with manual disengagement coupled to a 2-speed transmission.



1 of 2 identical molded friction facings used in Trailster clutches.



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More Power . . .
More Speed . . .

INDIANAPOLIS "500"

(Continued from page 38)

inches off center, to the driver's left.

The cars are built on a 96-in. tubular chassis, with magnesium firewall and Halibrand spot disk brakes. Three air jacks for high-speed tire changing during pit stops are a feature of this car. Mounting for one unit is forward, just behind the center of the front axle. The other two units are just in front of the rear axle, inboard of the frame rails on each side.

All three jacks are identical; 2½ in. diam, 14 in. length, with aluminum body units. They work at 300 psi, on an air hose connection on the left forward side of the engine compartment. The jacks raise the car off the ground in 0.3 sec, lower it in 0.7 sec. This can cut a pit stop by as much as a big 10 to 15 seconds.

As to the spring rate of the coils, Watson set it the same as the torsion bar suspension in his 1960 cars. He says he can replace the coils with torsion bars if the coils don't prove out at the track.

J. C. Agajanian, California car owner, has his No. 98 tuned up for the race. It's the car Watson built for him last year. Body mounting is off-center one inch—engine, eight inches. Offset is to driver's left. This car has the Watson weight-shifting device.

Three Kurtis Cars

Frank Kurtis has 124 Indianapolis racers to his credit. He built that many since 1946. One year, 1953, twenty-four of his cars came to the track. Kurtis-built creations have been in the top money five times.

This year, three new Kurtis cars are in the picture. Their engines incline 18 deg to the left. Usual incline is to the right. These slant-engine cars are practically identical. Tassi Vatis, White Plains, N. Y., and Fred Gerhardt, Fresno, Calif., are two of the owners.

The tail design is a feature that sets these cars off from most others. The tail has a horizontally sculp-

tured line, almost a GM Corvette's in miniature. Kurtis maintains he did his design before he saw the Corvette.

But it's more than for looks. It ups the fuel capacity to 57 gal. This type of racer usually carries 45 gal.

The cars have air jacks, one on each side at the rear, and one at the front, offset just to left of center.

Kurtis' engine placement, with a tilt to the left, gives the equivalent of about one inch more engine offset. It's a big point in the struggle to keep all possible weight to the inside in this all-left-turn event.

The body, too, is slightly off center to the left.

All three new Kurtis cars have the M&D engine. Kurtis chassis features are solid axle and cross torsion bars, 4130 chrome-moly tube frame, 1½ in. diam, with wall thickness ranging from 0.83 in. to 0.95 in. Cars weigh about 1600 lb dry.

John Zink Special

Troy Ruttman, 1952 Indianapolis winner, will pilot the new John Zink Special, designed by Jack Zink and Dennie Moore. This is the rear-engine-powered car originally meant for the Boeing turbine engine.

Meanwhile, the new Zink car will rely on the M&D. For the most part, the car is similar in design to the Cooper to be driven by Jack Brabham. It has Cooper steering and seat, and Girling brakes.

Suspension is by coil springs, double-A arms in conjunction with four midjet torsion bars. While the coils will carry the weight, the torsion bars will adjust weight. Drawings call for one-inch Monroe shock absorbers. Rear hubs and A-arms, by Moore and Zink, are used with rear center Halibrand section. There's Oldsmobile's F-85 front spindle equipment. Oil tank is in the tail section. Zink's fabricated A-arms are 7/8 in. 4130 chrome-moly .065 stock. Cooper's car uses ¾ in. of the same thickness.

The Zink racer, built around a 96-in. wheelbase, weighs some 1400 lb with the M&D engine. With the turbine engine, it will weigh about 1100 lb. Turbine engine weight 330 lb vs M&D over 500 lb.

The builders feel they have one of the chief problems licked—the turbine's slow acceleration. The engine turns at some 40,000 rpm, but with reductions will drive at the 6000-6500 rpm of the M&D. This means the same gear ratio as the M&D. The makers claim the turbine is capable of 375 hp.

The slightly V-shaped frame on the car weighs only 100 lb. A 10-deg engine tilt to the left makes room for the exhaust header out of the upper part of the body. Weight-saving features: aluminum underpan and side panels; rest of skin, fiberglass.

Fuel tank arrangement in the Zink car is somewhat different. Rather than a tail tank, the load is in two side tanks. Each carries 32 gal. One central spout serves both tanks. With a cross-over tube, the right tank fills first. The left side gets its fuel under pressure. To meet USAC safety rules, the tanks are fiber glass covered and enclosed by the body skin.

Design of the Zink car places 50 to 55 per cent of the fuel forward. With engine and transmission in the rear, the cockpit is roomier than in most Indianapolis cars. It's more comfortable, too, because there's no heat from the transmission or leaking oil problems.

Jim Robbins Special

Veteran builder Eddie Kuzma put together a new Jim Robbins Special for this year. On the team as chief mechanic is Louis Meyer, Jr., son of Indianapolis' great three-time winner and now head of the Meyer & Drake Company.

The new car has the usual chrome-moly tubing frame, with the engine placed 18 deg off horizontal and to the driver's left. Meyer uses the new M&D reverse rotation powerplant. With the engine near-horizontal, and sticking outside the frame, there's more pre-load on the left side. The engine, too, is off center in the chassis, putting still more weight on the left side.

The Robbins racer has an external water heater unit on the cylinder block side-plate. Just before the race, the unit will be plugged in at the pit. It will preheat the water to 180 F, the engine operating temperature. Big advantage: hot water

Bonded, rivetless, aluminum-cored structure of the Douglas A4D Skyhawk's rudder section prevents skin-crack failures. Conventional riveted structure could not stand pre-service load and vibration tests. Sonic flight vibration would have caused cracks between rivets on skin.

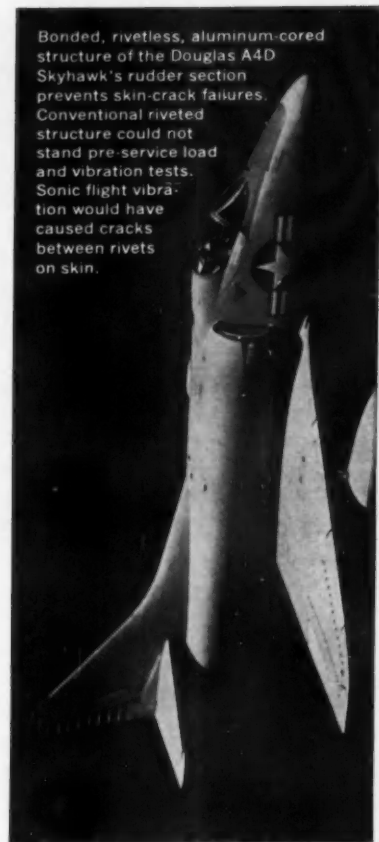


Photo courtesy Douglas Aircraft Company, Inc.

11 Ways Ray-BOND Adhesives Solve Tough Fastening Problems

New bonding and laminating techniques at R/M help solve difficult fastening problems and thereby make possible many of the new products being developed and produced by America's advancing technology. The advantages of Ray-BOND adhesives include:

- Rivets can be eliminated • Members too thin to rivet can be joined and fixed • Manufacturing costs are reduced • Life of wearing surfaces is extended • Heat conductivity is improved • Weight reduction is substantial • Load is uniformly distributed over joint area • Bond produces residual elasticity • Complex shapes can be easily fabricated • Electrical non-conductivity and protection against corrosion can be achieved • Methods of application are fast, economical, flexible

Counsel and detailed technical information regarding the selection and application of adhesives are freely available to you from Raybestos-Manhattan. An R/M representative can call on you promptly to discuss your requirements.

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quickly warms up all the cold metal in the engine—should send the car off to a flying start.

To save weight, a sportscar-type aluminum master cylinder replaces the usual cast-iron model. Power steering is expected to relieve driver strain on the 500-mile grind.

Some interesting features show up in Lindsey Hopkins' Autolite Dealers Assn. Special. Builder Quinn Epperly, Gardena, Calif., put in a two-piece drag link and vertical idler arm system. It's to reduce steering wheel vibration. The car has to use a two-piece radiator core. This arrangement gives clearance for the starter shaft.

There are two separate braking

systems: duals on rear, singles on front. Air jacks are on this car, too. Driver Tony Bettenhausen hopes to push the car into the winner's circle this year.

The car that's to mount the modified Corvette V-8 engine is owned by the San Diego Steel Products Co. Builder Chuck Chenoweth's job is a conventional Indianapolis-type racer with double-tube frame and cross torsion bars. With weight reduction a prime design target, much care went into construction. All welds are ground and smoothed, and some heavy parts chemically-milled to shed more weight. Eddie Kuzma did the body work.

The racer weighs 1460 lb—even

less, if they decide to use aluminum heads. A tail tank holds 59 gal and has a 4-gal reserve. The driver can use this with a three-way fuel valve. That's in case he needs an extra lap or two before a fuel stop.

Dean Van Lines has its two Kuzma-built specials ready again. Main change this year is a shift in engine placement—from center to left side of frame. It's in a near-horizontal position.

Andy Granatelli, Santa Monica, Calif., is the new owner of the two Novis. He bought cars and engines lock, stock, and barrel from Lou Welch. Their new name: Paxton Products Supercharged V-8 Specials.

The owner is pushing to ready at least one car for this year's race. Veteran chief mechanic Jean Marcenac is on the new team.

Mr. Granatelli told AUTOMOTIVE INDUSTRIES about a few of the engine modifications. They include changes in piston design, combustion area to accommodate dual ignition, and switch from fuel injection to standard carburetion. The engines will use straight methanol. ■

Classified Advertisement

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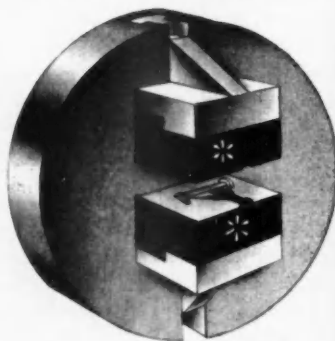
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Make Holding Fixtures Quickly / Easily with EPOCAST



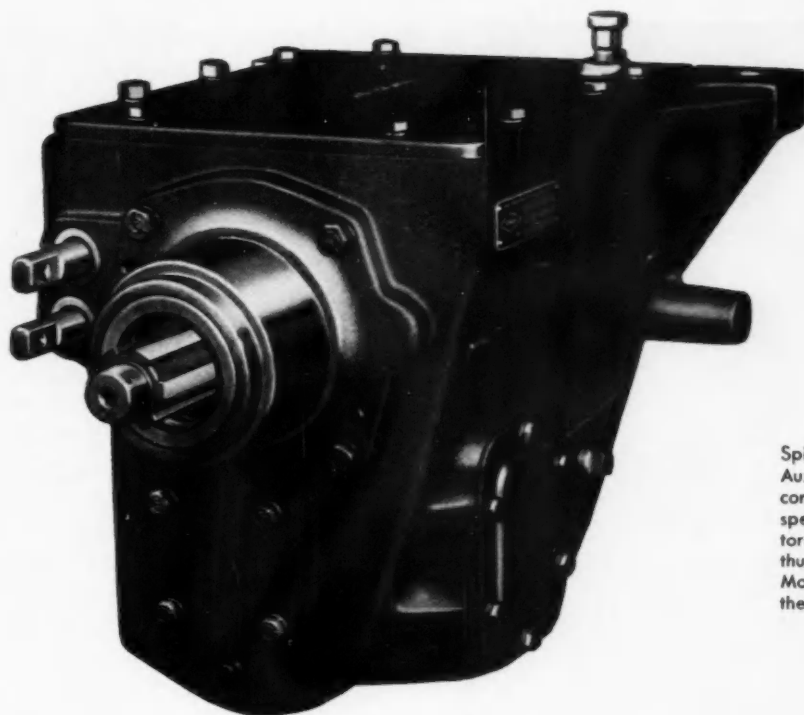
- Absorbs Inertia
- Eliminates Tool Chatter
- Compensates For Casting Variance
- Accurate
- Fast
- Protects Parts From Marring
- Inexpensive

*EPOCAST is an ideal material for making holding fixtures such as the plastic chucking jaws shown here. It casts in three simple steps. Sets tack free in 2 to 4 hours. Ready for use in 24 hours or less. Makes tooling easier. Send now for technical bulletin giving full information on making chucking jaws.

furane plastics
INCORPORATED

4516 Brazil Street, Los Angeles, California CHapman 5-1151 / 42 Chasner Street, Hempstead, Long Island, N. Y., lVanhoe 3-6246

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Spicer's new Model 7041 4-Speed Auxiliary Transmission—for use in conjunction with standard 4 or 5-speed transmissions—has a nominal torque rating of 550-600 ft. lbs., thus narrows the gap between the Model 6041 (375-400 ft. lbs.) and the 8341 (750-900 ft. lbs.)

New Spicer 4-Speed Auxiliary Transmission For Engines in the 400-600 Ft. Lbs. Torque Range

Model 7041 Broadens Range of Spicer Line, Utilizes Maximum H.P., Is Quiet, Saves Weight

Now—Spicer has added a new model to its power line of 4-speed auxiliary transmissions—the Model 7041—whose 550-600 ft. lbs. nominal torque rating meets a vast need for engines developing over 400 ft. lbs. of torque.

The 7041 operates most effectively with main transmissions in the 400-600 ft. lbs. capacity range. Ratios in the auxiliary are spaced so that they functionally split or compound the ratios of the main transmission.

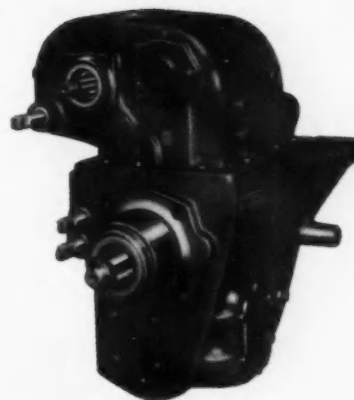
The new transmission has good splits in the top three gears, as the following table shows:

| RATIOS | Model | 1st | 2nd | 3rd | 4th |
|--------|-------|------|------|------|-----|
| | 7041 | 2.31 | 1.21 | 1.00 | .83 |

The result is that it is possible to utilize the maximum horsepower of the engine during shifts. In addition, the driver is able to complete shifts in these three splitter gear positions at the same R.P.M.

The new auxiliary transmission is also constant mesh in all gear positions, which makes for quieter operation and easier shifting due to the use of helical gears throughout. It is lighter and less bulky than any other 4-speed auxiliary transmission of similar capacity.

For complete data on the many advantages of the new Spicer 7041, write to Dana Corporation, Toledo 1, Ohio.



Spicer Top Mount Power Take-Off can readily be assembled to the 7041 Auxiliary Transmission by merely removing the cover, is ideal for operating air compressors, heavy-duty winches, large pumps, and other materials handling devices requiring full engine torque.



DANA

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Toledo 1, Ohio

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Many of these products are manufactured in Canada by Hayes Steel Products Limited, Meriton, Ontario



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Don Budge was supposed to win the Davis Cup at Wimbledon in 1937 but suddenly he was trailing 0-2 in sets. Bearing down, he painfully tied it up and then in the final set he was trailing 4-5. Games went with service until 6-6. At match point, his opponent left him-

self open and Budge put the United States within reach of the cup for the first time in ten years.

The pro delivers his best when the going is toughest. He demonstrates superior performance repeatedly because he has developed the necessary skills and desire to excel.

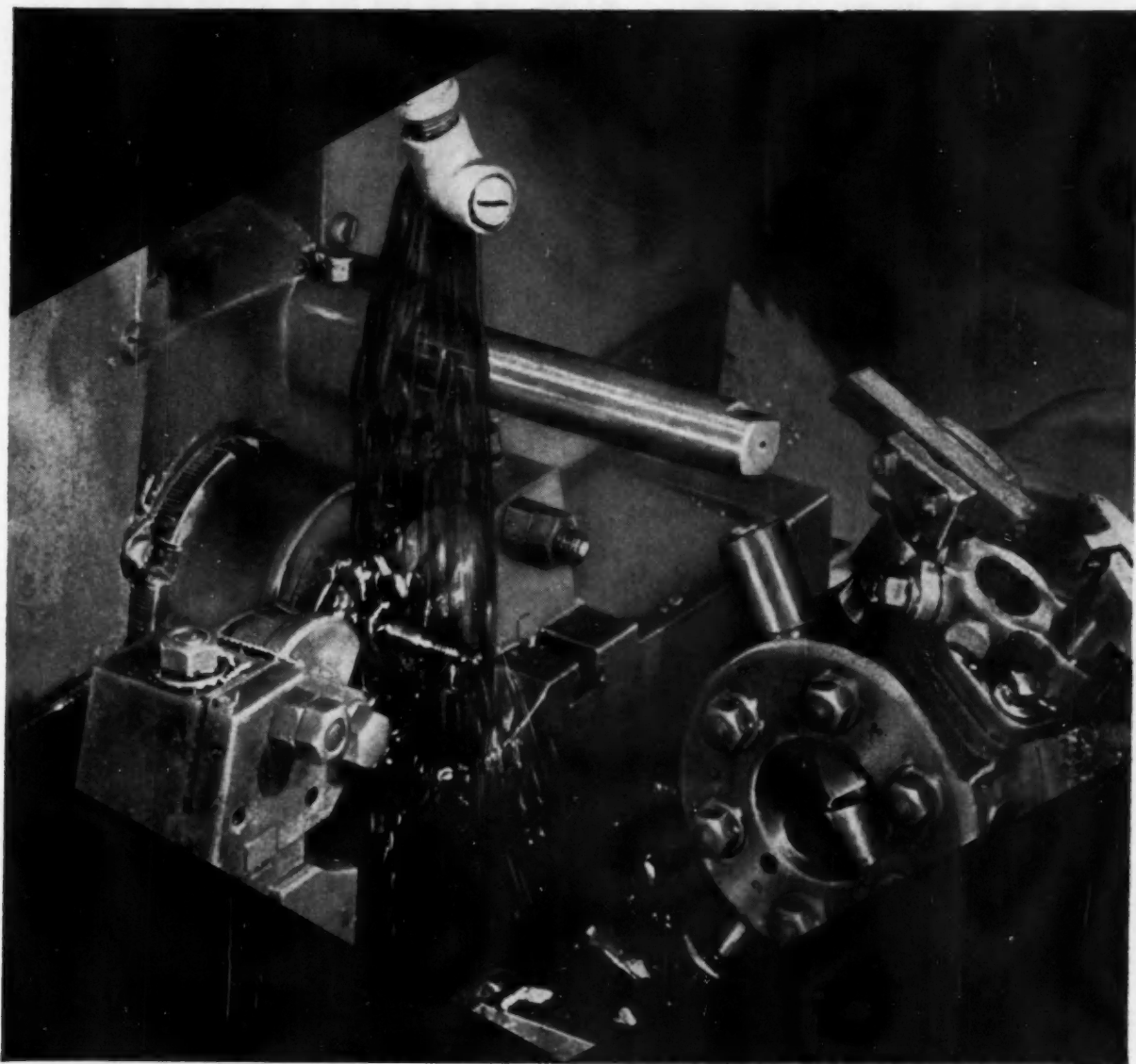
You'll find these qualities when you work with Timken bearing engineers—the pros of the bearing business. They have the skill and experience required to give your bearing problems professional attention. They have the desire to keep delivering a greater bearing value, year after year; to help reduce your bearing costs, assembly costs and warranty costs. And they're backed by a company with over 61 years' experience devoted to improving just one kind of bearing—the tapered roller bearing.

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You'll see significant savings, too, when you switch to a transparent Sunicut cutting oil. For you will get the exact *quality* you need for your operation . . . *job-fitted* by men who know what they are doing . . . teamed with *service* you never have to ask for twice.

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Sun Oil Company, Philadelphia 3, Pennsylvania, Department AA-5. In Canada: Sun Oil Company Limited, Toronto and Montreal.

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By C. J. Kelly
ASSISTANT EDITOR

Flame Plated Coatings 1

Up-to-date physical data and characteristics of flame-plated coatings are covered in a series of bulletins. *Linde Co., Div. Union Carbide Corp.*

Steel Castings 2

Design advantages and engineering properties of "T-1" alloy steel castings, plus welding and machining data, are covered in bulletin 300. *Alloy Steel & Metals Co.*

Support Equipment 3

Ground support equipment for the aircraft and missile industries is presented in an illustrated booklet. Included are leveling jacks, actuators, running gear, trailers, casters, and wheels to military specifications. *Saginaw Products Corp.*

Cylinder Accessories 4

A new reference bulletin provides a method for quick identification of mounting accessories for square-type, industrial hydraulic and pneumatic power cylinders. *Hannifin Co., Div. Parker Hannifin Corp.*

Automation 5

A 22-page booklet, bulletin 611, covers all phases of electric eye applications in automation. The booklet is a general roundup story of the history and development of electric eyes. Included is a wide range of illustrations and schematics showing diversified photoelectric systems. It is intended as the complete "answer book" on problems of automation for the engineer—design, process or manufacturing—to help him solve specific problems. *Photomation, Inc.*

Indexing Tables 6

Data sheet X60-A describes the new 7-inch-diameter Milichex rotary indexing table designed for precision work with small workpieces. The Model MX-3600-7" Milichex provides whole-degree angular indexing with an accuracy of $\frac{1}{4}$ second of arc. This data sheet lists all physical dimensions and tolerances, indicates operations in which tables are used and describes an available adapter plate that permits indexing to minutes and seconds of angles. *Michigan Tool Co.*

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Spade Drills 7

A new 6-page catalog covers a new line of inserted-blade spade drills and spade-drill holders. The catalog describes and gives dimensions and prices for three standard spade-drill blades: spade-type, core-type, and the new 3-lip blade. It also describes the blade holders, coolant connectors, and grinding fixtures for the drills. Special blade styles are also illustrated. *Erickson Tool Co.*

Design Problems 8

A new 16-page manual gives engineers and purchasing executives authoritative information needed to specify custom-designed and standardized precision springs. The new manual summarizes basic information concerning springs and parts. It emphasizes designing for performance, accurate material selection, and quality control measures that will result in parts that meet the specifications of the user and will insure performance reliability. *Associated Spring Corp.*

Tool Steels 9

Three low cost tool steels, suitable for short run tooling, are described in Data Sheets 25 and 26. Data Sheet 25 covers Heppenstall Grade A110, a general purpose carbon tool steel melted by the electric furnace process. Data Sheet 26 covers Heppenstall Grades 2V72 and 2V90, sold under the trade name, Cartos. The data sheets give general characteristics and typical applications, together with instructions for forging, annealing, hardening, and tempering, and other information. *Heppenstall Co.*

Milling Cutter 10

A complete line of indexable milling cutters is presented in a new 28 page catalog. The cutters are fully illustrated and dimensioned, with supporting data as to cutter style recommendations for various milling methods and materials. The catalog also contains technical data concerning milling feeds and speeds; trouble shooting procedure and check-off list; and factors that determine the degrees of finish—from roughing to low micro finishing. *Futurmill, Inc.*

Adapter Fittings 11

Catalog on pipe thread and straight thread adapters for tubing system connections has been revised and expanded to include straight thread adapters with new metal sealing rings. *Parker Fitting & Hose Div., Parker-Hannifin Corp.*

Plating Brighteners 12

Nickel, zinc and cadmium brighteners for the most efficient and economical bright still or barrel plating are described in a series of four technical booklets. Details on economical production of brilliant deposits directly from the bath, maximum throwing power, and elimination of subsequent bright drips are given for each process in the series. Also shown are: bath composition; operating data and instructions; maintenance; consumption figures; and special notes peculiar to the particular process. *The Meaker Co.*

Chain Hoist 13

The Hoist Manufacturers Association announces the completion of "HMA-400 Standard Specifications for Electric Chain Hoists." This is the fourth of a series of hoist specifications prepared by this Association of leading hoist builders. Booklets HMA-100, 200 and 300, recently issued, were concerned with Electric Wire Rope, Hand Chain, and Manually Lever Operated types of hoists. *Hoist Manufacturers Association, Inc.*

Electroplating 14

Electroplating processes bulletin, EP-103, is an expansion of EP-102 issued last year. Nineteen plating and other metal finishing processes and procedures are described. Solution preparation, type of deposits, operating conditions, equipment required, and applications are listed for each of the processes. *Hanson-Van Winkle-Munning Co.*

Motor Selection 15

Bulletin B-2515 shows and describes a complete line of Motors from 1 to 2000 hp. Product features of each motor are clearly outlined and explained for easy selection of the right motor for every application. *Reliance Electric & Engineering Co.*

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Molding of Plastics 16

An 8-page brochure, called the "Plastics Molding Data Book" begins with a 1600 word article which outlines the comparative merits of automatic versus semi-automatic molding of thermosetting materials, and clarifies some popular misconceptions about the automatic processes. *Dake Corp.*

Belt Grinder 17

Catalog 100 contains details on a new grinding machine that is replacing many operations previously done only by hand grinding. Examples of parts produced are given, including items requiring intermittent ground surfaces, fillets and difficult contours. Information is also provided on how the machine is built and it gives complete specifications on size, weight, speeds, electrical, air operating, and exclusive features of floating piston for belt tension, quick belt change feature, adjustments for belt alignment and tracking, and unique cam operating air-powered speed indexing of table. *Eastern Machine Screw Corp.*

Metals Handbook 18

A 32-page illustrated brochure describes the content of a new Metals Handbook, 8th Edition, Vol. 1, "Properties and Selection of Metals." The brochure includes actual examples from each of the Handbook's major sections, with information on how the book was compiled by 1335 metalworking experts in association with 83 author committees representing every area of industry. Four years in preparation, the new ASM Metals Handbook represents two and a half times as much information on properties and selection of metals as in the last edition. *American Society for Metals.*

Furnace Controls 19

The new revised furnace and oven controls bulletin B43-1d contains 40 pages of information and prices on electronic 15 potentiometers, millivoltmeters, thermocouples, radiometric detector, thermometers, flame safeguard systems, industrial controls, and final control elements. *Minneapolis-Honeywell Regulator Co.*

Cast-to-Shape 20

Cast-to-shape products are described in a new file folder. The new literature explains the company's versatile facilities to produce castings through the use of conventional sand casting, shell molding, or the ceramic (Shaw) molding process. The binder details how 50 years of tool steel manufacturing experience enables the production of outstanding cast-to-shape products. Sections in the illustrated folder describe patterns, molding, melting, finishing, and quality control, emphasizing the modern production equipment in the new department. *Vanadium-Alloy Co.*

Conveyor Systems 21

An 8 page brochure describes and illustrates a new conveyor material handling control system. The brochure, titled "Selector Systems" gives information on the low cost Elector and Mimic consoles developed for simplified, economical control of conveyor distribution. *Control Design & Fabricate, Inc.*

Ductile Vanadium 22

A brochure entitled "Ductile Vanadium: Techniques That Make Fabrication Easier" discusses new fabrication techniques for hot-worked and cold-worked ductile vanadium, including annealing range, extruding methods, machining and welding. A table summarizes how cold working affects strengths of ductile vanadium in various conditions. Photos show a number of fabricated materials. *Vanadium Corp. of America.*

Steel Processing 23

A new 16-page catalog on steel-processing equipment describes integrated slitting lines, cut-to-length (shear) lines, coil-handling equipment, strip mills and processing lines for rolling, cleaning, pickling and coating steel strip and non-ferrous metals, and equipment for wire drawing and flattening. The new catalog, with over 50 illustrations, presents an impressive array of steel-processing equipment—designed to meet the needs of the largest steel-working plant of the medium-size steel warehouse, fabricator, or manufacturer. *Steel Equipment Co.*

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Glass Ceramics 24

"This Is Glass" is a comprehensive story of glass and glass-ceramics. The 68-page illustrated booklet reviews the history of glass and details the basic types of glass. The publication describes the expanding role of glass in science, industry, electronics, lighting and the home. The booklet includes a section on Corning's new glass-ceramic materials, trademarked Pyroceram, and a two-page chart giving properties of selected glasses and glass-ceramics. *Corning Glass Works.*

Electrical Code 25

A 60-page publication details the applications of Condulets in hazardous locations. Code Articles 500-503, and 510-517 are quoted, along with recommendations for Condulets meeting the various Code requirements. More than 300 product photos, installation photographs, and drawings illustrate this informative bulletin. A valuable reference for planning electrical installations in any and all hazardous locations. *Crouse-Hinds Co.*

Lift Trucks 26

A line of lift trucks in the 2,000 to 10,000-lb capacity ranges is described in 16-page catalog BU-660. The new catalog is complete with photographs and other illustrations which visually help tell about design, engineering construction

and operating features of the lift trucks, their components and their power plants. Power curves and specifications of each of the lift trucks are included, along with information on matched attachments available to increase the versatility of each unit. *Allis-Chalmers Mfg. Co., Engine-Material Handling Div.*

Brazing Alloys 27

A revised and expanded 24-page, "Aircasil Silver Brazing Alloy Manual" has been released. Well illustrated and diagrammed, the brochure discusses brazing procedures, problems and solutions. Easy-to-read diagrams help select the proper Aircasil alloy to meet particular industrial needs. *Air Reduction Sales Co., Div. Air Reduction Co., Inc.*

Tooling Systems 28

Elements of a quick-change tooling system for drastically reducing machine tool downtime, and increasing individual operator output are fully covered in a new brochure. The 4-page, illustrated publication, No. FC-2-61, describes built-in features of Flash-Change tool holders, which allows cutting tools at machines to be changed in seconds; illustrates and details styles and adapters available for a wide range of machine tool spindles. *DeVlieg Microbore, Div. of DeVlieg Machine Co.*

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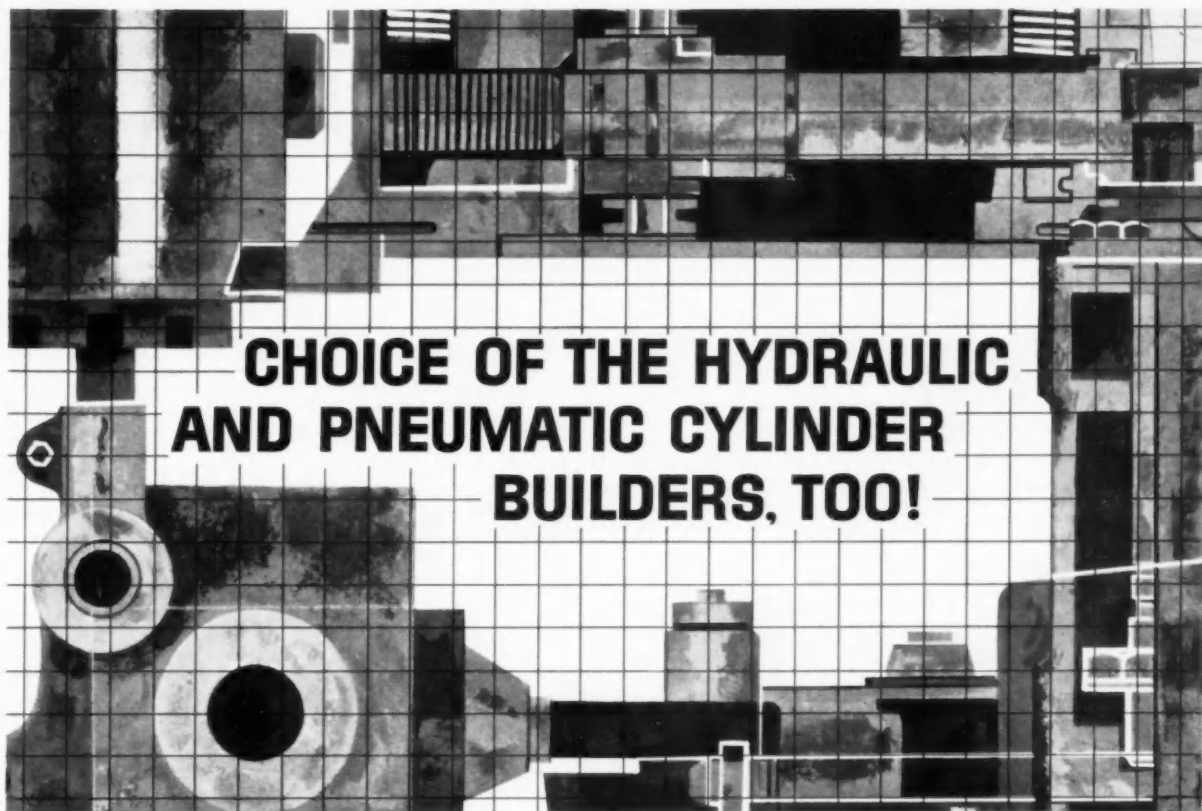
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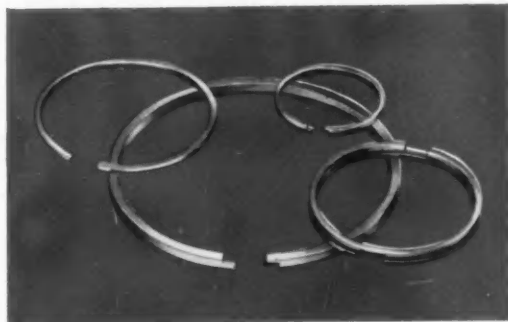


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SOLUTIONS TO GEAR PROBLEMS

PROBLEM: TO BOOST TRACTOR AXLE SPLINE STRENGTH WITHOUT HIGHER COST

To increase strength of tractor axle shafts produced by a major manufacturer without increasing diameter, Michigan recommended the use of a Roto-Flo machine to cold roll the splines. This resulted in a 60% increase in torque load capacity due to the cold working at the normally weakened section. The "chipless machining" process reduced stress concentrations by 37% and increased production rate three-fold over the slower previous hobbing method. The same machine is used for different sizes of shafts. There were also major savings in tool costs over hobbing.



Roto-Flo gives stronger splines at lower cost

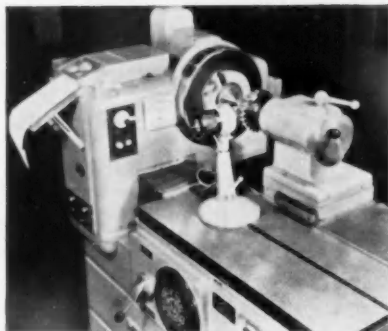
PROBLEM: NEEDED FAST ACCURATE INDEXING IN 1/4 DEGREE INCREMENTS

Operations performed on a missile part required extremely accurate indexing in quarter degrees. Precision indexing tables used before required special gage blocks, trigonometry tables and a lot of time. Michigan's answer was a double table version of its Milichex rotary indexing table. This new version, Model M2X-900, provides instant indexing to 1/4 degree settings with an accuracy of 1/4 second of arc. No gage blocks or trig tables are needed. Operator merely indexes upper and lower tables to proper settings and Milichex automatically locks into exact angular position.



This Milichex indexes in 1/4° increments

PROBLEM: 100% CHECK OF GEAR TOLERANCES TO TENTHS IN PRODUCTION

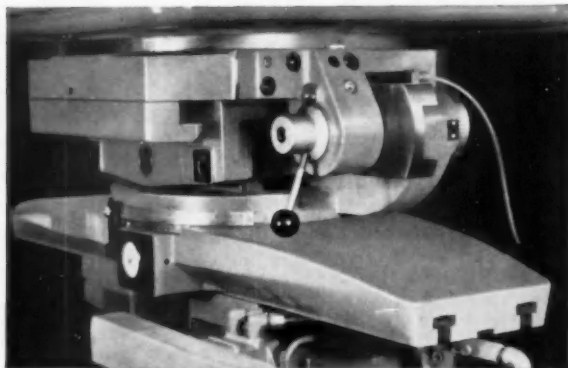


Production lead checking to laboratory tolerances on a 1218-A

A jet engine production bottleneck was the time required to accurately check the lead angle of gears to 0.0003 inch. A Michigan Sine Line 1218-A Lead Checker answered this need. Originally a 'laboratory' type checker, the machine with its precision optical system eliminates the need for "operator feel", records all checks, has the ruggedness for continuous production checking.

PROBLEM: TO SHAVE ANY COMBINATION OF CROWN & TAPER ON SAME MACHINE

Solved by a compact attachment for the Mark II shaving machine. Setting permanently installed attachment to scale controls amount of taper. An eccentric bushing in the attachment controls taper independently. For uncrowned untapered gears, both are set to 'zero'. Gears can be tapered or crowned with either transverse or modified underpass method. For spur gears, underpass method can also be used.



Taper & crown attachment for the Mark II gear shaver



MICHIGAN TOOL COMPANY, 7171 E. McNICHOLS RD., DETROIT 12, MICHIGAN

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